013764019 **Image available**
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Heater for image forming device has ceramic particles or synthetic resin particles dispersed in matrix form in the side of metal layer sliding with support

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Abstract (Basic): JP 2001006868 A

NOVELTY - The metal layer (5) is provided such that it slide with a support of the heater (10). Ceramic or synthetic resin particles are dispersed in the form of matrix in one side of the metal layer.

DETAILED DESCRIPTION - The ceramic particles dispersed in metal matrix consist of graphite, boron nitride and one kind of molybdenum disulfides and the particle size of ceramic particle is 0.1-10 mum.

INDEPENDENT CLAIMS are also included for the following:

(a) heating apparatus; and

(b) image forming device.

USE - Image forming device.

ADVANTAGE - The sliding friction of sliding surface with support of heater is reduced.

DESCRIPTION OF DRAWING(S) - The figure shows the lamination model diagram of heater.

Metal layer (5)

Heater (10)

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Title Terms: HEATER; IMAGE; FORMING; DEVICE; CERAMIC; PARTICLE; SYNTHETIC; RESIN; PARTICLE; DISPERSE; MATRIX; FORM; SIDE; METAL; LAYER; SLIDE; SUPPORT
Derwent Class: L02; L03; P84; X25
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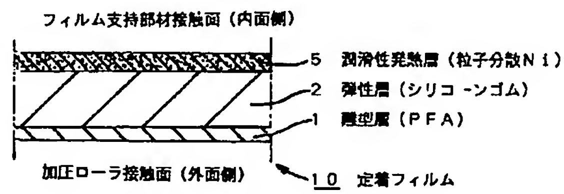
(54)【発明の名称】 加熱部材、加熱装置および画像形成装置

(57)【要約】
【課題】一方の面が支持部材と摺動し他方の面が被加熱部材と接して被加熱部材を加熱する加熱部材10、該加熱部材を有する加熱装置について、加熱部材の支持部材との摺動抵抗を低減し、また通紙耐久による摺動抵抗の増加を抑制する。
【解決手段】上記加熱部材10の支持部材と摺動する面に、セラミック粒子もしくは合成樹脂粒子の少なくとも一方を金属マトリックス中に分散させた金属層5を設けたこと。あるいは、加熱部材の支持部材と摺動する面に、セラミック粒子もしくは合成樹脂粒子の少なくとも一方を金属マトリックス中に分散させた金属層を設け、さらにこの層の支持部材側とは反対面側に単一金属もしくは合金で構成される金属層を積層させたこと。



【特許請求の範囲】
【請求項１】一方の面が支持部材と摺動し他方の面が被加熱部材と接して被加熱部材を加熱する加熱部材であって、支持部材と摺動する面にセラミックス粒子もしくは合成樹脂粒子の少なくとも一方を金属マトリックス中に分散させた金属層を設けたことを特徴とする加熱部材。
【請求項２】一方の面が支持部材と摺動し他方の面が被加熱部材と接して被加熱部材を加熱する加熱部材であって、支持部材と摺動する面にセラミックス粒子もしくは合成樹脂粒子の少なくとも一方を金属マトリックス中に分散させた金属層を設け、さらにこの層の支持部材側とは反対面側に単一金属もしくは合金で構成される金属層を積層させたことを特徴とする加熱部材。
【請求項３】前記金属マトリックス中に分散されたセラミックス粒子は窒化ホウ素もしくグラファイトもしくは二硫化モリブデンのうちの少なくとも１種類からなり、その粒径は０．１～１０μｍであることを特徴とする請求項１に記載の加熱部材。
【請求項４】前記金属マトリックス中に分散されたセラミックス粒子は窒化ホウ素もしくグラファイトもしくは二硫化モリブデンのうちの少なくとも１種類からなり、その粒径は０．１～１０μｍであることを特徴とする請求項２に記載の加熱部材。
【請求項５】前記金属マトリックス中に前記セラミックス粒子が分散されている金属層において、セラミックス粒子の全ての含有量が０．２～２０重量%であることを特徴とする請求項１または３に記載の加熱部材。
【請求項６】前記金属マトリックス中に前記セラミックス粒子が分散されている金属層において、セラミックス粒子の全ての含有量が０．２～３０重量%であることを特徴とする請求項２または４に記載の加熱部材。
【請求項７】前記金属マトリックス中に分散された合成樹脂粒子はフッ素樹脂からなり、その粒径は０．１～１０μｍであることを特徴とする請求項１に記載の加熱部材。
【請求項８】前記金属マトリックス中に分散された合成樹脂粒子はフッ素樹脂からなり、その粒径は０．１～１０μｍであることを特徴とする請求項２に記載の加熱部材。
【請求項９】前記合成樹脂粒子が分散されている金属層において、合成樹脂粒子の全ての含有量が２～４０体積%であることを特徴とする請求項１または７に記載の加熱部材。
【請求項１０】前記合成樹脂粒子が分散されている金属層において、合成樹脂粒子の全ての含有量が２～５０体積%であることを特徴とする請求項２または８に記載の加熱部材。
【請求項１１】前記粒子が分散されている金属マトリックスは、ニッケルもしくはニッケル基合金であることを特徴とする請求項１から１０の何れかに記載の加熱部材。
【請求項１２】交番磁場の作用により電磁誘導発熱する層を有することを特徴とする請求項１から１１の何れかに記載の加熱部材。
【請求項１３】被加熱部材側の表面に離型層を有することを特徴とする請求項１から１２の何れかに記載の加熱部材。
【請求項１４】回転体であることを特徴とする請求項１から１３の何れかに記載の加熱部材。
【請求項１５】エンドレスフィルム状の回転体であることを特徴とする請求項１から１３の何れかに記載の加熱部材。
【請求項１６】被加熱部材を加熱する加熱部材として請求項１から１５の何れかに記載の加熱部材を有することを特徴とする加熱装置。
【請求項１７】一方の面が支持部材と摺動し他方の面が被加熱部材と接する加熱部材を有し、該加熱部材で被加熱部材を加熱する加熱装置において、加熱部材が請求項１から１５の何れかに記載の加熱部材であることを特徴とする加熱装置。
【請求項１８】一方の面が支持部材と摺動し他方の面が被加熱部材と接する加熱部材と、該加熱部材を介して支持部材に圧接してニップを形成する加圧部材と、を有し、前記ニップ部の加熱部材と加圧部材の間で被加熱部材を挟持搬送して加熱部材で被加熱部材を加熱する加熱装置において、加熱部材が請求項１から１５の何れかに記載の加熱部材であることを特徴とする加熱装置。
【請求項１９】前記加熱部材は、前記加圧部材もしくは加熱部材外周面に圧接する圧接部材と加熱部材との表面の摩擦によって、加圧部材もしくは圧接部材に従動して駆動されることを特徴とする請求項１８に記載の加熱装置。
【請求項２０】前記被加熱部材が未定着トナー像を担持した被記録材であり、加熱部材の熱により未定着トナー像が被記録材に熱定着されることを特徴とする請求項１６から１９の何れかに記載の加熱装置。
【請求項２１】交番磁場を作用させて前記加熱部材を電磁誘導発熱させる手段を有することを特徴とする請求項１６から２０の何れかに記載の加熱装置。
【請求項２２】被記録材に未定着トナー像を形成する画像形成手段と、その未定着トナー像を被記録材に熱定着させる加熱定着手段を有する画像形成装置において、加熱定着手段が請求項１６から２１の何れかに記載の加熱装置であることを特徴とする画像形成装置。
【請求項２３】前記画像形成装置は、カラー画像形成が可能であることを特徴とする請求項２２に記載の画像形成装置。
【発明の詳細な説明】
【０００１】
【発明の属する技術分野】本発明は、加熱部材、加熱装

置および画像形成装置に関する。
【０００２】より詳しくは、一方の面が支持部材と摺動し他方の面が被加熱部材と接して被加熱部材を加熱する加熱部材、該加熱部材を被加熱部材の加熱手段として備えた加熱装置、および該加熱装置を画像加熱定着装置として備えた画像形成装置に関する。
【０００３】本発明において、加熱装置は、例えば、画像形成装置において被記録材に形成担持させた未定着画像を被記録材に永久固着画像として熱定着させる像加熱装置（加熱定着装置、加熱定着器）、未定着画像を加熱して仮定着させる像加熱装置、画像を担持した被記録材を加熱して艶等の表面性を改質する像加熱装置、その他の被加熱材を乾燥やラミネート等の熱処理する装置である。
【０００４】
【従来の技術】以下、画像形成装置の画像加熱定着装置を例にして説明する。
【０００５】従来、画像形成装置において、適宜の画像形成プロセス手段で被記録材に間接あるいは直接に形成担持させた未定着トナー画像を被記録材面に永久固着画像として加熱定着させる定着装置としては、熱ローラ方式の装置が広く用いられている。近年では、クイックスタートや省エネルギーの観点からフィルム加熱方式の装置が実用化されているが、さらに高効率な定着装置として金属からなるフィルム自身を発熱させる電磁誘導加熱方式の装置が提案されている。
【０００６】実開昭５１－１０９７３９号公報には、交番磁場により加熱部材（発熱体）としての定着フィルムの金属層に渦電流を誘導させて、そのジュール熱で発熱させる誘導加熱定着装置が開示されている。これは、誘導電流の発生を利用することで直接定着フィルムを発熱させることができ、ハロゲンランプを熱源とする熱ローラ方式の定着装置よりも高効率の定着プロセスを達成している。
【０００７】しかしながら、磁場発生手段としての励磁コイルにより発生した交番磁束のエネルギーは定着フィルム全体の昇温に使われるため放熱損失が大きい。そのため、投入したエネルギーに対して定着に作用するエネルギーの割合が低く、効率が悪いという欠点があった。
【０００８】そこで、定着に作用するエネルギーを高効率で得るために、加熱部材である定着フィルムに励磁コイルを接近させたり、励磁コイルの交番磁束分布を定着ニップ部近傍に集中させたりして、高効率の定着装置が考案された。
【０００９】図１１に、励磁コイルの交番磁束分布を定着ニップ部に集中させて効率を向上させた電磁誘導加熱方式の定着装置の一例の概略構成を示す。
【００１０】１０は電磁誘導発熱層（導電体層、磁性体層、抵抗体層）を有する加熱部材としての円筒状の定着フィルムである。
【００１１】１６は横断面略半円弧状樋型のフィルム支持部材であり、円筒状定着フィルム１０はこのフィルム支持部材１６の外側にルーズに外嵌させてある。
【００１２】１５はフィルム支持部材１６の内側に配設した磁場発生手段であり、励磁コイル１８とＥ型の磁性コア（芯材）１７とからなる。
【００１３】３０は弾性加圧ローラであり、定着フィルム１０を挟ませてフィルム支持部材１６の下面と所定の圧接力をもって所定幅の定着ニップ部Ｎ（加熱ニップ部）を形成させて相互圧接させてある。前記磁場発生手段１５の磁性コア１７は定着ニップ部Ｎに対応させて配設してある。
【００１４】加圧ローラ３０は駆動手段Ｍにより矢示の反時計方向に回転駆動される。この加圧ローラ３０の回転駆動により、前記加圧ローラ３０と定着フィルム１０の外面との摩擦力で定着フィルム１０に回転力が作用して、前記定着フィルム１０がその内面が定着ニップ部Ｎにおいてフィルム支持部材１６の下面に密着して摺動しながら矢示の時計方向に加圧ローラ３０の周速度にほぼ対応した周速度をもってフィルム支持部材１６の外周を回転する（加圧ローラ駆動方式）。
【００１５】フィルム支持部材１６は、定着ニップ部Ｎへの加圧、磁場発生手段１５としての励磁コイル１８と磁性コア１７の支持、定着フィルム１０の支持、定着フィルム１０の回転時の搬送安定性を図る役目をする。このフィルム支持部材１６は磁束の通過を妨げない絶縁性の部材であり、高い荷重に耐えられる材料が用いられる。
【００１６】図１２に加熱部材としての定着フィルム１０の層構成の概略図を示す。定着フィルム１０は外側から内側に順に離型層１、弾性層２、発熱層３を有する複合フィルムである。離型層１はＰＦＡ等の離型性の良いフッ素樹脂等で構成される。弾性層２はシリコーンゴム等の弾性に富む合成ゴム等で構成される。発熱層３は電磁誘導による渦電流により自己発熱する層であり、ニッケル等の強磁性金属で構成される。この発熱層３に非磁性金属を用いても良いが、強磁性金属を用いた場合に比べて発熱効率は低下する。
【００１７】励磁コイル１８は不図示の励磁回路から供給される交番電流によって交番磁束を発生する。交番磁束は定着ニップ部Ｎの位置に対応しているＥ型の磁性コア１７により定着ニップ部Ｎに集中的に分布し、その交番磁束は定着ニップ部Ｎにおいて定着フィルム１０の発熱層３に渦電流を発生させる。この渦電流は電磁誘導発熱層の固有抵抗によって発熱層３にジュール熱を発生させる。
【００１８】この定着フィルム１０の電磁誘導発熱は交番磁束を集中的に分布させた定着ニップ部Ｎにおいて集中的に生じて定着ニップ部Ｎが高効率に加熱される。
【００１９】定着ニップ部Ｎの温度は、温度検知手段

（不図示）を含む温調制御系により、励磁コイル１８への電流供給が制御されることで所定の温度が維持されるように温調される。
【００２０】而して、加圧ローラ３０が回転駆動され、それに伴って加熱部材としての円筒状の定着フィルム１０がフィルム支持部材１６の外周を回転し、励磁回路からの励磁コイル１８への給電により、上記のように定着フィルム１０の電磁誘導発熱がなされて定着ニップ部Nが所定の温度に立ち上がる。そして温調された状態において、画像形成手段部（不図示）から搬送された未定着トナー画像ｔが形成された被記録材Pは、定着ニップ部Nの定着フィルム１０と加圧ローラ３０との間に画像面が上向きに、即ち定着フィルム面に対向して導入され、定着ニップ部Nにおいて画像面が定着フィルム１０の外面に密着して定着フィルム１０と一緒に定着ニップ部Nを挟持搬送されていく。この定着ニップ部Nを定着フィルム１０と一緒に被記録材Pが挟持搬送されていく過程において定着フィルム１０は加熱されて、被記録材P上の未定着トナー画像ｔが加熱定着される。被記録材Pは定着ニップ部Nを通過後、定着フィルム１０の外周面から離れて搬送されていく。
【００２１】
【発明が解決しようとしている課題】しかしながら、以上に述べたような加熱部材としての定着フィルム１０の内周面がフィルム支持部材１６の表面と摺動する構成の定着装置では、以下のような問題があった。
【００２２】すなわち、定着フィルム１０の回転時は、定着ニップ部Nにおいて前記定着フィルム１０の内面とフィルム支持部材１６の表面とが摺擦するため、定着フィルム１０の内面とフィルム支持部材１６の表面との間の摺動性が定着装置の駆動トルクを大きく左右する。特に加圧ローラ３０駆動の場合、この摺動性が悪いと、定着フィルム１０とフィルム支持部材１６との摺動抵抗が大きくなり、定着フィルム１０と駆動伝達手段の加圧ローラ３０との間でスリップが発生しやすい。特に、通紙時においては、定着フィルム１０と共に搬送される被記録材Pと加圧ローラ３０との間でスリップが発生しやすい。
【００２３】この摺動抵抗は、定着ニップ部Nにかかる加圧力が大きいほど大きい。特に、トナー載り量の多いフルカラー画像形成装置の定着装置として用いる場合、定着性を向上させるために、モノカラー画像形成装置の定着装置より加圧力を大きくして、ニップ幅を広く取る必要がある。またOHPフィルム上のカラートナー像の透過性を向上させるために、加圧力を大きくして定着ニップ部N内の面圧をより高くし、トナー像表面を平滑化する必要がある。このように、フルカラー画像形成装置の定着装置として使用すると、加圧力が高いために、摺動抵抗が大きく、スリップ発生が顕著となる。
【００２４】トナー像ｔを載せた被記録材Pの通紙時にスリップが発生した場合、過剰な熱供給とスリップによりトナー像ｔが乱され、画像上にスリップ跡が発生する。また、このスリップにより、定着装置での被記録材Pの排紙タイミングが遅れて、うまく排紙できずにジャムが発生しやすい。さらに、定着フィルム１０の回転時の摺動抵抗が大きいほど、定着装置の駆動モータに大きな駆動トルクを要求されるため、駆動モータのコストが上昇する問題があった。
【００２５】以上のような問題を解決するために、特開平５－２７６１９号公報に提案されているように、定着フィルム１０の内周面とフィルム支持部材１６との間に耐熱グリース等の潤滑剤を介在させることにより、定着フィルム１０の回転時の摺動抵抗を軽減させる方法がある。
【００２６】しかしながら、定着装置内部のような高温下で耐熱グリースを使用し続けると、グリースが劣化したり、摺動部である定着ニップ部Nに分布するグリース量が減少して、潤滑性が失われる。さらに、定着フィルム１０の内周面の金属層の摺動時の削れによるキズや、その削れ粉よっても、潤滑性が失われる。このように、耐熱グリースを塗布しても、摺動抵抗が低い状態は長続きせず、徐々に摺動抵抗が増加する傾向がある。そのため、定着装置を使用し続けるほど、被記録材Pの搬送が不安定になり、被記録材Pのスリップが多発し、画像不良や定着装置でのジャムが多発する問題があった。
【００２７】よって、前記潤滑剤の塗布に頼らずに、加熱部材としての定着フィルム１０の内面もしくはフィルム支持部材１６自体の表面の潤滑性を向上させる必要がある。
【００２８】そこで本発明は、一方の面が支持部材と摺動し他方の面が被加熱部材と接して被加熱部材を加熱する加熱部材の支持部材との摺動抵抗を低減し、さらに通紙耐久による摺動抵抗の増加を抑制することを目的とする。
【００２９】
【発明が解決しようとしている手段】本発明は、下記に述べる構成を特徴とする加熱部材、加熱装置および画像形成装置である。
【００３０】（１）一方の面が支持部材と摺動し他方の面が被加熱部材と接して被加熱部材を加熱する加熱部材であって、支持部材と摺動する面にセラミックス粒子もしくは合成樹脂粒子の少なくとも一方を金属マトリックス中に分散させた金属層を設けたことを特徴とする加熱部材。
【００３１】（２）一方の面が支持部材と摺動し他方の面が被加熱部材と接して被加熱部材を加熱する加熱部材であって、支持部材と摺動する面にセラミックス粒子もしくは合成樹脂粒子の少なくとも一方を金属マトリックス中に分散させた金属層を設け、さらにこの層の支持部材側とは反対面側に単一金属もしくは合金で構成される

金属層を積層させたことを特徴とする加熱部材。
【0032】（3）前記金属マトリックス中に分散されたセラミックス粒子は窒化ホウ素もしくグラファイトもしくは二硫化モリブデンのうちの少なくとも1種類からなり、その粒径は0．1～10μmであることを特徴とする（1）に記載の加熱部材。
【0033】（4）前記金属マトリックス中に分散されたセラミックス粒子は窒化ホウ素もしくグラファイトもしくは二硫化モリブデンのうちの少なくとも1種類からなり、その粒径は0．1～10μmであることを特徴とする（2）に記載の加熱部材。
【0034】（5）前記金属マトリックス中に前記セラミックス粒子が分散されている金属層において、セラミックス粒子の全ての含有量が0．2～20重量%であることを特徴とする（1）または（3）に記載の加熱部材。
【0035】（6）前記金属マトリックス中に前記セラミックス粒子が分散されている金属層において、セラミックス粒子の全ての含有量が0．2～30重量%であることを特徴とする（2）または（4）に記載の加熱部材。
【0036】（7）前記金属マトリックス中に分散された合成樹脂粒子はフッ素樹脂からなり、その粒径は0．1～10μmであることを特徴とする（1）に記載の加熱部材。
【0037】（8）前記金属マトリックス中に分散された合成樹脂粒子はフッ素樹脂からなり、その粒径は0．1～10μmであることを特徴とする（2）に記載の加熱部材。
【0038】（9）前記合成樹脂粒子が分散されている金属層において、合成樹脂粒子の全ての含有量が2～40体積%であることを特徴とする（1）または（7）に記載の加熱部材。
【0039】（10）前記合成樹脂粒子が分散されている金属層において、合成樹脂粒子の全ての含有量が2～50体積%であることを特徴とする（2）または（8）に記載の加熱部材。
【0040】（11）前記粒子が分散されている金属マトリックスは、ニッケルもしくはニッケル基合金であることを特徴とする（1）から（10）の何れかに記載の加熱部材。
【0041】（12）交番磁場の作用により電磁誘導発熱する層を有することを特徴とする（1）から（11）の何れかに記載の加熱部材。
【0042】（13）被加熱部材側の表面に離型層を有することを特徴とする（1）から（12）の何れかに記載の加熱部材。
【0043】（14）回転体であることを特徴とする（1）から（13）の何れかに記載の加熱部材。
【0044】（15）エンドレスフィルム状の回転体であることを特徴とする（1）から（13）の何れかに記載の加熱部材。
【0045】（16）被加熱部材を加熱する加熱部材として（1）から（15）の何れかに記載の加熱部材を有することを特徴とする加熱装置。
【0046】（17）一方の面が支持部材と摺動し他方の面が被加熱部材と接する加熱部材を有し、該加熱部材で被加熱部材を加熱する加熱装置において、加熱部材が（1）から（15）の何れかに記載の加熱部材であることを特徴とする加熱装置。
【0047】（18）一方の面が支持部材と摺動し他方の面が被加熱部材と接する加熱部材と、該加熱部材を介して支持部材に圧接してニップを形成する加圧部材と、を有し、前記ニップ部の加熱部材と加圧部材の間で被加熱部材を挟持搬送して加熱部材で被加熱部材を加熱する加熱装置において、加熱部材が（1）から（15）の何れかに記載の加熱部材であることを特徴とする加熱装置。
【0048】（19）前記加熱部材は、前記加圧部材もしくは加熱部材外周面に圧接する圧接部材と加熱部材との表面の摩擦によって、加圧部材もしくは圧接部材に従動して駆動されることを特徴とする（18）に記載の加熱装置。
【0049】（20）前記被加熱部材が未定着トナー像を担持した被記録材であり、加熱部材の熱により未定着トナー像が被記録材に熱定着されることを特徴とする（16）から（19）の何れかに記載の加熱装置。
【0050】（21）交番磁場を作用させて前記加熱部材を電磁誘導発熱させる手段を有することを特徴とする（16）から（20）の何れかに記載の加熱装置。
【0051】（22）被記録材に未定着トナー像を形成する画像形成手段と、その未定着トナー像を被記録材に熱定着させる加熱定着手段を有する画像形成装置において、加熱定着手段が（16）から（21）の何れかに記載の加熱装置であることを特徴とする画像形成装置。
【0052】（23）前記画像形成装置は、カラー画像形成が可能であることを特徴とする（22）に記載の画像形成装置。
【0053】〈作　用〉金属マトリックスにセラミックス粒子もしくは合成樹脂粒子の少なくとも一方を分散させた金属層は、セラミックス粒子もしくは合成樹脂粒子を分散含有させていない金属層よりも、潤滑性が格段に優れる。また耐摩耗性も向上する。
【0054】本発明は、一方の面が支持部材と摺動し他方の面が被加熱部材と接して被加熱部材を加熱する、金属層を有する加熱部材、および該加熱部材を有する加熱装置において、加熱部材の支持部材と摺動する面にセラミックス粒子もしくは合成樹脂の少なくとも一方を金属マトリックス中に分散させた金属層を設けたことで、加熱部材の支持部材との摺動面の摺動抵抗を低減し、さら

に通紙耐久による摺動抵抗の増加を抑制することが出来る。

【0055】よって、被加熱部材のスリップを防止できるので、安定した被加熱部材の搬送を確保することができ、画像加熱定着装置にあっては、高品位な画像と安定した被記録材の搬送を提供することが可能となる。

【0056】さらに、加熱装置の駆動モータとして、駆動トルクのより小さなものを使用することができるので、製品コストの低減につながる。

【0057】

【発明の実施の形態】以下に本発明の実施形態について説明する。

【0058】〈第1の実施例〉(図1〜図9)

(1)画像形成装置例

図1は画像形成装置の一例の構成略図である。本例の画像形成装置は電子写真プロセス利用のカラーレーザプリンタである。

【0059】101は像担持体としての、有機感光体やアモルファスシリコン感光体でできた感光ドラムであり、矢示の反時計方向に所定のプロセス速度(周速度)で回転駆動される。

【0060】感光ドラム101はその回転過程で帯電ローラ等の帯電装置102で所定の極性・電位の一様な帯電処理を受ける。

【0061】次いでその帯電処理面にレーザ光学箱(レーザスキャナー)110から出力されるレーザ光103により画像情報の走査露光処理を受ける。レーザ光学箱110は不図示の画像読み取り装置等の画像信号発生装置からの画像情報の時系列電気デジタル画素信号に対応して変調(オン/オフ)したレーザ光103を出力し、感光ドラム101面を走査露光しする。これにより感光ドラム面に画像情報に対応した静電潜像が形成される。109はレーザ光学箱110からの出力レーザ光を感光ドラム101の露光位置に偏向させるミラーである。

【0062】フルカラー画像形成の場合は、目的のフルカラー画像の第1の色分解成分画像、例えばイエロー成分画像についての走査露光・潜像形成がなされ、その潜像が4色カラー現像装置104のうちのイエロー現像器104Yの作動でイエロートナー画像として現像される。そのイエロートナー画像は感光ドラム101と中間転写ドラム105との接触部(或いは近接部)である一次転写部T1において中間転写ドラム105面に転写される。中間転写ドラム105面に対するトナー画像転写後の感光ドラム101面はクリーナ107により転写残トナー等の付着残留物の除去を受けて清掃される。

【0063】上記のような帯電・走査露光・現像・一次転写・清掃のプロセスサイクルが、目的のフルカラー画像の第2の色分解成分画像(例えばマゼンタ成分画像、マゼンタ現像器104Mが作動)、第3の色分解成分画像(例えばシアン成分画像、シアン現像器104Cが作動)、第4の色分解成分画像(例えば黒成分画像、黒現像器104BKが作動)の各色分解成分画像について順次実行され、中間転写ドラム105面にイエロートナー画像・マゼンタトナー画像・シアントナー画像・黒トナー画像の4色のトナー画像が順次重ねて転写されて、目的のフルカラー画像に対応したカラートナー画像が形成される。

【0064】中間転写ドラム105は、金属ドラム上に中抵抗の弾性層と高抵抗の表層を設けたもので、感光ドラム101に接触して或いは近接して感光ドラム101と同じ周速度で矢示の時計方向に回転駆動され、中間転写ドラム105の金属ドラムにバイアス電位を与えて感光ドラム101との電位差で感光ドラム101側のトナー画像を前記中間転写ドラム105面側に転写させる。

【0065】上記の中間転写ドラム105面に形成されたカラートナー画像は、前記中間転写ドラム105と転写ローラ106との接触ニップ部である二次転写部T2において、前記二次転写部T2に不図示の給紙部から所定のタイミングで送り込まれた被記録材Pの面に転写されていく。転写ローラ106は被記録材Pの背面からトナーと逆極性の電荷を供給することで中間転写ドラム105面側から被記録材P側へ合成カラートナー画像を順次に一括転写する。

【0066】二次転写部T2を通過した被記録材Pは中間転写ドラム105面から分離されて定着装置(像加熱装置)100へ導入され、未定着トナー画像の加熱定着処理を受けて、機外の不図示の排紙トレーに排出される。定着装置100については次の(2)項で詳述する。

【0067】被記録材Pに対するカラートナー画像転写後の中間転写ドラム105はクリーナ108により転写残トナー・紙粉等の付着残留物の除去を受けて清掃される。このクリーナ108は常時は中間転写ドラム105に非接触状態に保持されており、中間転写ドラム105から被記録材Pに対するカラートナー画像の二次転写実行過程において中間転写ドラム105に接触状態に保持される。

【0068】また転写ローラ106も常時中間転写ドラム105に非接触状態に保持されており、中間転写ドラム105から被記録材Pに対するカラートナー画像の二次転写実行過程において中間転写ドラム105に被記録材Pを介して接触状態に保持される。

【0069】本実施例の画像形成装置は、白黒画像などモノカラー画像のプリントモードも実行できる。また両面画像プリントモードも実行できる。

【0070】両面画像プリントモードの場合は、定着装置100を出た1面目画像プリント済みの被記録材Pは不図示の再循環搬送機構を介して表裏反転されて再び二次転写部T2へ送り込まれて2面に対するトナー画像転写を受け、再度、定着装置100に導入されて2面に対

するトナー画像の定着処理を受けることで両面画像プリントが出力される。

【００７１】（２）定着装置１００

本実施例における加熱装置としての定着装置１００は電磁誘導加熱方式の装置である。図２は本例の定着装置１００の要部の横断側面模型図、図３は要部の正面模型図、図４は要部の縦断模型図である。

【００７２】本実施例の定着装置１００は前述図１１の定着装置と同様に、加熱部材として電磁誘導発熱性の円筒状の定着フィルムを用いた、加圧ローラ駆動方式、電磁誘導加熱方式の装置である。図１１の装置と共通の構成部材・部分には同一の符号を付して再度の説明を省略する。

【００７３】磁場発生手段は磁性コア１７ａ・１７ｂ・１７ｃ及び励磁コイル１８からなる。

【００７４】磁性コア１７ａ・１７ｂ・１７ｃは高透磁率の部材であり、フェライトやパーマロイ等といったトランスのコアに用いられる材料がよく、より好ましくは１００ｋＨｚ以上でも損失の少ないフェライトを用いるのがよい。

【００７５】励磁コイル１８には給電部１８ａ・１８ｂに励磁回路２７（図５）を接続してある。この励磁回路２７は２０ｋＨｚから５００ｋＨｚの高周波をスイッチング電源で発生できるようになっている。

【００７６】励磁コイル１８は励磁回路２７から供給される交番電流（高周波電流）によって交番磁束を発生する。

【００７７】１６ａ，１６ｂは横断面略半円弧状樋型のフィルム支持部材であり、開口側を互いに向かい合わせて略円柱体を構成し、その外側に加熱部材である円筒状の定着フィルム１０をルーズに外嵌させてある。

【００７８】前記フィルム支持部材１６ａは、磁場発生手段としての磁性コア１７ａ・１７ｂ・１７ｃと励磁コイル１８を内側に保持している。また、フィルム支持部材１６ａには図４のように紙面垂直方向を長手とする良熱伝導部材４０が定着ニップ部Ｎの加圧ローラ３０との対向面側で、定着フィルム１０の内側に配設してある。

【００７９】この良熱電導性部材４０は、定着ニップ部Ｎにおいて、加圧ローラ３０の加圧力に対して、定着フィルム１０をその内周面から支持する部材である。本実施例においては、良熱伝導性部材４０にアルミニウムを用いている。前記良熱伝導部材４０は熱伝導率ｋがｋ＝２４０［$W \cdot m^{-1} \cdot K^{-1}$］であり、厚さ１［ｍｍ］である。また、良熱伝導部材４０は磁場発生手段である励磁コイル１８と磁性コア１７ａ・１７ｂ・１７ｃから発生する磁場の影響を受けないように、この磁場の外に配設してある。具体的には、良熱伝導部材４０を励磁コイル１８に対して磁性コア１７ｃを隔てた位置に配設し、励磁コイル１８による磁路の外側に位置させて良熱伝導部材４０に影響を与えないようにしている。

【００８０】２２はフィルム支持部材１６ｂの内面平面部と良熱伝導部材４０に当接させて配設した横長の加圧用剛性ステイである。

【００８１】１９は磁性コア１７ａ・１７ｂ・１７ｃ及び励磁コイル１８と加圧用剛性ステイ２２の間を絶縁するための絶縁部材である。

【００８２】フランジ部材２３ａ・２３ｂはフィルム支持部材１６ａ・１６ｂのアセンブリの左右両端部に外嵌し、前記左右位置を固定しつつ回転自在に取り付け、定着フィルム１０の回転時に前記定着フィルム１０の端部を受けて定着フィルム１０のフィルム支持部材１６長手に沿う寄り移動を規制する役目をする。

【００８３】加圧部材としての加圧ローラ３０は、芯金３０ａと、前記芯金周りに同心一体にローラ状に成形被覆させた、シリコーンゴム・フッ素ゴム・フッ素樹脂などの耐熱性弾性材層３０ｂとで構成されており、芯金３０ａの両端部を装置の不図示のシャーシ側板金間に回転自由に軸受け保持させて配設してある。

【００８４】加圧用剛性ステイ２２の両端部と装置シャーシ側のバネ受け部材２９ａ・２９ｂとの間にそれぞれ加圧バネ２５ａ・２５ｂを縮設することで加圧用構成ステイ２２に押し下げ力を作用させている。これにより良熱伝導部材４０の下面と加圧ローラ３０の上面とが定着フィルム１０を挟んで圧接して所定幅の定着ニップ部Ｎが形成される。

【００８５】加圧ローラ３０は駆動手段Ｍ（図２）により矢示の反時計方向に回転駆動される。この加圧ローラ３０の回転駆動により、前記加圧ローラ３０と定着フィルム１０の外面との摩擦力で定着フィルム１０に回転力が作用し、前記定着フィルム１０の内周面が定着ニップ部Ｎにおいて良熱伝導部材４０の下面に密着して摺動しながら矢示の時計方向に加圧ローラ３０の周速度にほぼ対応した周速度をもってフィルム支持部材１６ａ・１６ｂの外周を回転する。

【００８６】良熱伝導部材４０は長手方向の温度分布を均一にする効果があり、例えば、小サイズ紙を通紙した場合、定着フィルム１０での非通紙部の熱量が良熱伝導部材４０へ伝熱し、良熱伝導部材４０における長手方向の熱伝導により、非通紙部の熱量が小サイズ紙通紙部へ伝熱される。これにより、小サイズ紙通紙時の消費電力を低減させる効果も得られる。

【００８７】また、図５に示すように、フィルム支持部材１６ａの周面に、その長手方向に所定の間隔を置いて凸リブ部１６ｃを形成具備させ、フィルム支持部材１６ａの周面と定着フィルム１０の内面との接触摺動抵抗を低減させて定着フィルム１０の回転負荷を少なくしている。このような凸リブ部１６ｃはフィルム支持部材１６ｂにも同様に形成具備することができる。

【００８８】図６は交番磁束の発生の様子を模式的に表したものである。磁束Ｃは発生した交番磁束の一部を表

す。磁性コア17a・17b・17cに導かれた交番磁束Cは、磁性コア17aと磁性コア17bとの間、そして磁性コア17aと磁性コア17cとの間において定着フィルム10の電磁誘導発熱層に渦電流を発生させる。この渦電流は電磁誘導発熱層の固有抵抗によって電磁誘導発熱層にジュール熱（渦電流損）を発生させる。ここでの発熱量Qは電磁誘導発熱層を通る磁束の密度によって決まり図6のグラフような分布を示す。

【0089】図6のグラフは、縦軸が磁性コア17aの中心を0とした角度θで表した定着フィルム10における円周方向の位置を示し、横軸が定着フィルム10の電磁誘導発熱層での発熱量Qを示す。ここで、発熱域Hは最大発熱量をQとした場合、発熱量がQ／e以上の領域と定義する。これは、定着に必要な発熱量が得られる領域である。

【0090】この定着ニップ部Nの温度は、不図示の温度検知手段を含む温調系により励磁コイル18に対する電流供給が制御されることで所定の温度が維持されるように温調される。

【0091】26（図2）は定着フィルム10の温度を検知するサーミスタなどの温度センサであり、本例においては温度センサ26で測定した定着フィルム10の温度情報をもとに定着ニップ部Nの温度を制御するようにしている。

【0092】而して、定着フィルム10が回転し、励磁回路27から励磁コイル18への給電により上記のように定着フィルム10の電磁誘導発熱がなされて定着ニップ部Nが所定の温度に立ち上がって温調された状態において、画像形成手段部から搬送された未定着トナー画像tが形成された被記録材Pが定着ニップ部Nの定着フィルム10と加圧ローラ30との間に画像面が上向き、即ち定着フィルム面に対向して導入され、定着ニップ部Nにおいて画像面が定着フィルム10の外面に密着して定着フィルム10と一緒に定着ニップ部Nを挟持搬送されていく。この定着ニップ部Nを定着フィルム10と一緒に被記録材Pが挟持搬送されていく過程において定着フィルム10の電磁誘導発熱で加熱されて被記録材P上の未定着トナー画像tが加熱定着される。被記録材Pは定着ニップ部Nを通過すると定着フィルム10の外面から分離して排出搬送されていく。被記録材P上の加熱定着トナー画像tは定着ニップ部Nを通過後、冷却して永久固着像となる。

【0093】フルカラー画像形成装置の定着装置100の定着ニップ部Nの幅は、トナー載り量の多いフルカラー画像の定着性を十分に確保するために、最短でも7．0mm以上が好ましい。これ以下であると、未定着トナーtと被記録材Pに定着に十分な熱量を与えることができないため、定着不良が発生してしまう。また、OHPフィルムのフルカラー画像の透過性を十分に確保するために、さらに定着ニップ部Nの面圧は0．8kgf／cm^2 以上が好ましい。これ以下であると、定着されたトナー層t表面を十分に平滑にすることができないため、乱反射光が多くなり、OHPフィルム上の画像部の透過光量が少なくなってしまう。

【0094】以上の観点から、本実施例の定着装置100では、加圧ローラ30と定着フィルム10を21kgfで加圧させ、定着ニップ部Nの幅を約8．0mm、定着ニップ部Nの面圧を1．2kgf／cm^2 とした（定着ニップ部Nの長手方向の長さは220mm）。

【0095】本実施例においては、図2に示すように、定着フィルム10の発熱域H（図6）の対向位置に暴走時の励磁コイル18への給電を遮断するため温度検知素子であるサーモスイッチ50を配設している。

【0096】図7は本実施例で使用した安全回路の回路図である。温度検知素子であるサーモスイッチ50は24VのDC電源とリレースイッチ51と直列に接続されており、サーモスイッチ50が切れると、リレースイッチ51への給電が遮断され、リレースイッチ51が動作し、励磁回路27への給電が遮断されることにより励磁コイル18への給電を遮断する構成をとっている。サーモスイッチ50はOFF動作温度を220℃に設定した。

【0097】また、サーモスイッチ50は定着フィルム10の発熱域Hに対向して定着フィルム10の外面に非接触に配設した。サーモスイッチ50と定着フィルム10との間の距離は約2mmとした。これにより、定着フィルム10にサーモスイッチ50の接触による傷が付くことがなく、耐久による定着画像の劣化を防止することができる。

【0098】本実施例によれば、装置故障による定着装置暴走時、前述の図11の装置のような定着ニップ部Nで発熱する構成とは違い、定着ニップ部Nに紙が挟まった状態で定着装置が停止し、励磁コイル18に給電が続けられ定着フィルム10が発熱し続けた場合でも、紙が挟まっている定着ニップ部Nでは発熱していないために紙が直接加熱されることがない。また、発熱量が多い発熱域Hには、サーモスイッチ50が配設してあるため、サーモスイッチ50が220℃を感知して、サーモスイッチが切れた時点で、リレースイッチ51により励磁コイル18への給電が遮断される。

【0099】本実施例によれば、紙の発火温度は約400℃近辺であるため紙が発火することなく、定着フィルム10の発熱を停止することができる。

【0100】温度検知素子としてサーモスイッチのほかに温度ヒューズを用いることもできる。

【0101】本実施例ではトナーtに低軟化物質を含有させたトナーを使用したため、定着装置100にオフセット防止のためのオイル塗布機構を設けていないが、低軟化物質を含有させていないトナーを使用した場合にはオイル塗布機構を設けてもよい。また、低軟化物質を含有させたトナーを使用した場合にもオイル塗布や冷却分

離を行ってもよい。

【０１０２】Ａ）励磁コイル１８
励磁コイル１８はコイル（線輪）を構成させる導線（電線）として、一本ずつがそれぞれ絶縁被覆された銅製の細線を複数本束ねたもの（束線）を用い、これを複数回巻いて励磁コイルを形成している。本例では１０ターン巻いて励磁コイル１８を形成している。

【０１０３】絶縁被覆は定着フィルム１０の発熱による熱伝導を考慮して耐熱性を有する被覆を用いるのがよい。たとえば、アミドイミドやポリイミドなどの被覆を用いるとよい。

【０１０４】励磁コイル１８は外部から圧力を加えて密集度を向上させてもよい。

【０１０５】励磁コイル１８の形状は図２のように発熱層の曲面に沿うようにしている。本例では定着フィルム１０の発熱層と励磁コイル１８との間の距離は約２ｍｍになるように設定した。

【０１０６】励磁コイル保持部材１９の材質としては絶縁性に優れ、耐熱性がよいものがよい。例えば、フェノール樹脂、フッ素樹脂、ポリイミド樹脂、ポリアミド樹脂、ポリアミドイミド樹脂、ＰＥＥＫ樹脂、ＰＥＳ樹脂、ＰＰＳ樹脂、ＰＦＡ樹脂、ＰＴＦＥ樹脂、ＦＥＰ樹脂、ＬＣＰ樹脂などを選択するとよい。

【０１０７】磁性コア１７ａ，１７ｂ，１７ｃ及び励磁コイル１８と、定着フィルム１０の発熱層との間の距離はできる限り近づけた方が磁束の吸収効率が高いのであるが、この距離が５ｍｍを越えるとこの効率が著しく低下するため５ｍｍ以内にするのがよい。また、５ｍｍ以内であれば定着フィルム１０の発熱層と励磁コイル１８の距離が一定である必要はない。

【０１０８】励磁コイル１８の励磁コイル保持部材１９からの引出線すなわち１８ａ・１８ｂ（図５）については、励磁コイル保持部材１９から外の部分について束線の外側に絶縁被覆を施している。

【０１０９】Ｂ）定着フィルム１０
図８は本実施例における定着フィルム１０の層構成模型図である。

【０１１０】本実施例の定着フィルム１０は、フィルム内周面にセラミックス粒子が分散された金属で構成される潤滑性発熱層５を設けていることを特徴とする。この潤滑性発熱層５の外周面に弾性層２と、さらにその外周面に離型層１とを積層した複合構造の定着フィルム１０である。

【０１１１】この潤滑性発熱層５が電磁誘導発熱層として機能すると共に、加熱部材としての円筒状の定着フィルム１０の内周面の潤滑性を向上させる。

【０１１２】潤滑性発熱層５と弾性層２との間の接着、弾性層２と離型層１との間の接着のために、各層間にプライマー層（不図示）を設けてもよい。

【０１１３】略円筒形状である定着フィルム１０において、潤滑性発熱層５がフィルムガイド接触面側であり、離型層１が加圧ローラ接触面側である。前述したように、発熱層の役割も兼ねる潤滑性発熱層５に交番磁束が作用することで、潤滑性発熱層５に渦電流が発生して前記潤滑性発熱層５が発熱する。この層で誘導発熱した熱が弾性層２・離型層１を介して定着フィルム１０全体を加熱し、定着ニップ部Ｎに通紙される被記録材Ｐを加熱してトナーｔ画像の加熱定着がなされる。

【０１１４】ａ．潤滑性発熱層５
潤滑性発熱層５を形成するマトリックス金属は、ニッケル、鉄、強磁性ＳＵＳ、ニッケル－コバルト合金といった強磁性金属、もしくはアルミニウムといった非磁性金属でも良い。

【０１１５】また、定着フィルム１０の内周面の耐久性向上に着目して、ニッケル－リンやニッケル－リン－ボロン等の耐摩耗性の高い合金でも良い。

【０１１６】また、マトリックス金属にニッケルを用いた場合、定着フィルム１０の回転時に受ける繰り返しの屈曲応力による金属疲労を防ぐために、ニッケル中にマンガンを添加するのも良い。

【０１１７】潤滑性発熱層５は潤滑層及び発熱層としての作用を有しているため、マトリックス金属は非磁性金属よりも高効率に電磁誘導発熱させる強磁性金属が好ましい。より好ましくは、電解めっきや無電解めっきによる作製が比較的容易なニッケルもしくはニッケル基合金が好ましい。

【０１１８】潤滑性発熱層５は、これらの金属マトリックス中にセラミックス粒子を分散させることで、電磁誘導発熱だけでなく、定着フィルム１０の内周面の潤滑性向上の作用も有する。

【０１１９】よって、このセラミックス粒子は、摩擦係数の低いものが良く、自己潤滑性の高いセラミックスが好ましい。自己潤滑性の高いセラミックスとしては、結晶構造が六方格子で層状構造をなす窒化ホウ素・グラファイト・二硫化モリブデンが良い。このうち電解めっきで潤滑性発熱層５を作成する場合、電鋳内に分散させやすいものである窒化ホウ素がより好ましい。

【０１２０】また、セラミックス粒子を分散させることにより、潤滑性発熱層５の耐摩耗性も向上させることができる。よって、定着フィルム内周面の摺動抵抗と金属の摩耗による削れ粉を低減できるので、長期にわたり、定着フィルム１０と、良熱伝導部材４０・フィルム支持部材１６との摺動抵抗を低減させることができる。

【０１２１】これらのセラミックス粒子の粒径は、０．１～１０μｍが好ましい。これより過大でも過小でも、十分な潤滑性を得ることができない。また、これらの粒子が分散される潤滑性発熱層５の層厚が１０μｍよりも薄い場合、粒子の最大粒径はこの層厚を越えないのが好ましい。粒径が層厚よりも大きいと、表面に粒子の凹凸が発生し、定着ニップ部Ｎでの圧接により定着フィルム

１０が変形してしまう恐れがある。

【０１２２】セラミックス粒子の含有量は必要に応じて適宜設定することができるが、０．２～２０重量%が好ましい。０．２重量%以下であると、分散させたセラミックス粒子による潤滑性・耐摩耗性向上の効果があまり認められない。また、セラミックス粒子の含有量が２０重量%を越えると、得られる複合めっき被膜が脆くなり、可撓性が低下するだけでなく、発熱効率も低下して定着能力が低下するため、好ましくない。

【０１２３】潤滑性発熱層５の厚みは、次の式で表される表皮深さより厚く、かつ２００μｍ以下にすることが好ましい。表皮深さσ［ｍ］は、励磁回路の周波数ｆ［Ｈｚ］と透磁率μと固有抵抗ρ［Ωｍ］で

$\sigma = 503 \times (\rho / f\mu)^{1/2}$

と表される。

【０１２４】これは電磁誘導で使われる電磁波の吸収の深さを示しており、これより深いところでは電磁波の強度は１／ｅ以下になっていることを示す。逆に言うと、殆どのエネルギーはこの深さまでで吸収されている（図９）。

【０１２５】潤滑性発熱層５の厚さは好ましくは１μｍ以上１００μｍ以下がよい。潤滑性発熱層５の厚みが１μｍよりも薄いと、ほとんどの電磁エネルギーが吸収しきれないため効率が悪くなる。また、潤滑性発熱層５が１００μｍを超えると剛性が高くなりすぎ、また屈曲性が悪くなり回転体として使用するには現実的ではない。

【０１２６】本発明の特徴である潤滑性発熱層５（窒化ホウ素粒子分散ニッケル）は、電解めっき法により得られた複合電鋳である。潤滑性発熱層５は、以下に述べるような条件で作製された。まず、スルファミン酸ニッケル、シュウ化ニッケル、硼酸、窒化ホウ素粒子を配合した水溶液を準備し、活性炭を充填した容器と電解槽との間を循環通液しながら電解精製を行ったのち、応力減少剤、ピット防止剤を添加して電解浴を調整した。これらの電解浴に適宜の光沢剤を加え、浴温、ｐＨ値を所定値に保って撹拌を続けながら、回転するステンレス鋼製の円筒状母型を陰極、ニッケルペレットを入れたチタン製バスケットを陽極として、窒化ホウ素粒子を分散させた厚さ約６０μｍの電析体を形成した。得られた潤滑性発熱層５における窒化ホウ素粒子の含有量は５．５重量%であった。

【０１２７】以上の構成の潤滑性発熱層５は、定着フィルム１０内周面の潤滑性を向上させ、定着フィルム１０と、良熱伝導部材４０・フィルム支持部材１６との摺動抵抗を低減する役割を担う。よって、定着装置１００の駆動トルクを低減することができる。

【０１２８】ｂ．弾性層２

弾性層２は、シリコーンゴム、フッ素ゴム、フルオロシリコーンゴム等で、耐熱性、熱伝導率が良い材質が用いられる。

【０１２９】弾性層２の厚さは１０～５００μｍが好ましい。この弾性層２は定着画像品質を保証するために必要な厚さである。

【０１３０】カラー画像を印刷する場合、特に写真画像などでは被記録材Ｐ上で大きな面積に渡ってベタ画像が形成される。この場合、被記録材Ｐの凹凸あるいはトナー層ｔの凹凸に加熱面（離型層１）が追従できないと加熱ムラが発生し、伝熱量が多い部分と少ない部分で画像に光沢ムラが発生する。伝熱量が多い部分は光沢度が高く、伝熱量が少ない部分では光沢度が低い。弾性層２の厚さとしては、１０μｍ以下では被記録材あるいはトナー層の凹凸に追従しきれず画像光沢ムラが発生してしまう。また、弾性層２が１０００μｍ以上の場合には弾性層の熱抵抗が大きくなりクイックスタートを実現するのが難しくなる。より好ましくは弾性層２の厚みは５０～５００μｍが良い。

【０１３１】弾性層２は、硬度が高すぎると被記録材Ｐあるいはトナー層ｔの凹凸に追従しきれず画像光沢ムラが発生してしまう。そこで、弾性層２の硬度としては６０°（ＪＩＳ－Ａ：ＪＩＳ－Ｋ　Ａ型試験機）以下、より好ましくは４５°以下がよい。　弾性層２の熱伝導率λに関しては、$6 \times 10^{-4} \sim 2 \times 10^{-3}$ [cal/cm・sec・deg]がよい。熱伝導率λが6×10^{-4} [cal/cm・sec ・deg]よりも小さい場合には、熱抵抗が大きく、定着フィルム１０の表層（離型層１）における温度上昇が遅くなる。熱伝導率λが2×10^{-3} [cal/cm・sec ・deg]よりも大きい場合には、硬度が高くなりすぎたり、圧縮永久歪みが悪化する。よって熱伝導率λは$6 \times 10^{-4} \sim 2 \times 10^{-3}$ [cal/cm・sec ・deg]が良い。より好ましくは$8 \times 10^{-4} \sim 1.5 \times 10^{-3}$ [cal/cm・sec ・deg]が良い。

【０１３２】ｃ．離型層１

離型層１はフッ素樹脂、シリコーン樹脂、フルオロシリコーンゴム、フッ素ゴム、シリコーンゴム、ＰＦＡ、ＰＴＦＥ、ＦＥＰ等の離型性かつ耐熱性のよい材料を選択することができる。

【０１３３】離型層１の厚さは１～１００μｍが好ましい。離型層１の厚さが１μｍよりも小さいと塗膜の塗ムラで離型性の悪い部分ができたり、耐久性が不足するといった問題が発生する。また、離型層が１００μｍを超えると熱伝導が悪化するという問題が発生し、特に樹脂系の離型層の場合は硬度が高くなりすぎ、弾性層２の効果がなくなってしまう。

【０１３４】Ｃ）効　果

本実施例の定着フィルム１０の構成は、離型層１としてＰＦＡ３０μｍ、弾性層２としてシリコーンゴム３００μｍ、潤滑性発熱層５として、平均粒径約１μｍの窒化ホウ素粒子をニッケル内に５．５重量%分散させた複合めっき６０μｍからなる。

【０１３５】本実施例で潤滑性発熱層５に分散させた粒

子の窒化ホウ素は、六方晶の結晶構造をもち、1000℃以上の雰囲気でも窒化ホウ素単体で摩擦係数0．2程度を維持する優れた潤滑性を示すものである。
【0136】比較例として用いた定着フィルム10の構成は前述した従来例の図12の層構成のものである。即ち、1はPFAからなる離型層、2はシリコーンゴムからなる弾性層、3はニッケルからなる発熱層である。比較例の定着フィルム10の構成において、本実施例における定着フィルム10と異なる点は、本実施例のような潤滑性発熱層5ではなく、単に電磁誘導発熱するニッケルからなる発熱層3を設けていることで、それ以外の離型層1、弾性層2については、材質、層厚ともに同一である。比較例の定着フィルム10の発熱層3の層厚は、本実施例の定着フィルム10の潤滑性発熱層5の層厚（60μm）と同等になるように60μmに設定した。これにより、各層1・2・3の層厚は比較例と本実施例で同等であり、定着フィルム10全体の膜厚も同等となる。
【0137】本実施例の効果は、定着装置100の駆動トルクとジャム発生率を評価することで確認した。
【0138】まず、本実施例と比較例の定着フィルム10を装着した各々の定着装置100をフルカラー画像形成装置に組み込んで、通紙耐久を行った。
【0139】比較例の定着フィルム10では、そのままだと摺動抵抗が高く、安定した紙搬送が実現できなかったため、潤滑剤として耐熱グリース約1gをフィルムガイド接触面側に塗布した。通紙速度は、1分間にA4サイズ紙が16枚通紙される速さで、通紙中の温調は定着可能温度である190℃に設定した。
【0140】そして、A4サイズ紙を10万枚通紙する前後での定着装置100の駆動トルクと、スリップ発生率の変化を調べた。
【0141】駆動トルクについては、定着フィルム10が駆動伝達手段である加圧ローラ30に従動回転する構成であるので、駆動トルクは加圧ローラ30の軸トルクを測定した。評価方法は、定着温調状態で空回転時の軸トルクを10万枚通紙前と後で測定し比較することとした。
【0142】スリップについては、被記録材Pと加圧ローラ30間で発生するスリップの発生率を調べた。このスリップの発生は、定着装置100に設けられた排紙センサー（不示図）は被記録材Pが所定時間内に定着装置100から排紙されたかを検知するもので、その検知信号をモニターすることで、スリップの発生回数を知ることができる。評価方法は、10万枚通紙において、初期0〜5000ページ間と、終盤95000〜100000ページ間におけるスリップ発生率を調べ、比較した。
【0143】これらの結果を、表1の実施例1及び比較例の箇所に示す。
【0144】表1に示すように、比較例の定着フィルム10では、10万枚の通紙耐久前後で、駆動トルクが2．3kgf・cm増加した。これは、グリースのオイル成分が揮発したことによるグリースの劣化と、摺動により発生したニッケル層の削れ粉により、グリースの潤滑性が失われたためである。
【0145】また、耐久初期はスリップが発生することはなかったが、耐久終盤では、駆動トルク増加により、スリップ発生率が増大した。
【0146】一方、本実施例では、耐久初期において、潤滑剤の塗布無しに、比較例とほぼ同等の駆動トルクを実現できる。
【0147】さらに、10万枚通紙後においても、駆動トルクは+0．3kgf・cmの増加に抑えられており、通紙初期の駆動トルクをほぼ維持していることが分かる。スリップも耐久初期と終盤で発生することはなかった。
【0148】このように、本実施例の定着フィルム10により、終始安定した被記録材の搬送を実現することができる。
【0149】
【表1】

表1

	実施例1	実施例2	比較例
定着フィルム内周面	BN粒子＋ニッケル	PTFE粒子＋ニッケル	ニッケル（＋グリース）
駆動トルク (kgf･cm)			
耐久前	3.0	2.8	2.6
耐久後	3.3 <+0.3>	3.0 <+0.2>	4.9 <+2.3>
スリップ発生率			
耐久初期	0	0	0
耐久終盤	0	0	131/5000

BN:窒化ホウ素　　< >内は、耐久後−耐久前の軸トルクの差を表す

【0150】〈第2の実施例〉次に第2の実施例について説明する。以下に述べる定着フィルム10の構成を除き、定着装置・画像形成装置の構成は実施例1と同様であるので、これらについての説明は省略する。以下に、本実施例の定着フィルムについて説明する。
【0151】1）定着フィルム10

本実施例の定着フィルム１０も、実施例１の図８の定着フィルム１０と同様に、定着フィルム１０の内周面に、金属マトリックス中に粒子を分散させた層である潤滑性発熱層５を設けた。実施例１と異なる点は、潤滑性発熱層５の金属マトリックス中に分散させる粒子を合成樹脂としたことである。

【０１５２】この合成樹脂に、実施例１で用いた自己潤滑性のあるセラミックスよりも摩擦係数が小さいフッ素樹脂を用いることで、さらに潤滑性発熱層５の潤滑性を向上させることができる。

【０１５３】また、実施例１のセラミックスを分散させた場合よりも、潤滑性発熱層５の内周面の硬度を低くすることができる。

【０１５４】定着フィルム１０の内周面と摺動する良熱伝導体４０・フィルム支持部材１６の材質の硬度が潤滑性発熱層５よりも低い場合に、その硬度差をより小さくすることができるので、良熱伝導部材４０・フィルム支持部材１６の摩耗を低減することができる。ひいては、摺動抵抗の低減につながる。

【０１５５】２）潤滑性発熱層５

潤滑性発熱層５を除き、離型層１、弾性層２は実施例１と同様であるので、これらについての説明は省略する。

【０１５６】実施例１と同様に、潤滑性発熱層５を形成するマトリックス金属は、ニッケル、鉄、強磁性ＳＵＳ、ニッケル－コバルト合金といった強磁性金属、もしくはアルミニウムといった非磁性金属でも良い。また、定着フィルム１０の内周面の耐久性向上に着目して、ニッケル－リンやニッケル－リン－ボロン等の耐摩耗性の高い合金でも良い。また、マトリックス金属にニッケルを用いた場合、定着フィルム１０の回転時に受ける繰り返しの屈曲応力による金属疲労を防ぐために、ニッケル中にマンガンを添加するのも良い。

【０１５７】潤滑性発熱層５は潤滑層及び発熱層としての作用を有しているため、マトリックス金属は非磁性金属よりも高効率に電磁誘導発熱させる強磁性金属が好ましい。より好ましくは、電解めっきや無電解めっきによる作製が比較的容易なニッケルもしくはニッケル基合金が好ましい。

【０１５８】本実施例の潤滑性発熱層５は、上述のマトリックス金属中にフッ素樹脂粒子を分散させたものである。

【０１５９】このフッ素樹脂としては、例えば、ＰＦＡ、ＦＥＰ、ＰＴＦＥ、ＥＴＦＥ、ＰＣＴＦＥ、ＥＣＴＦＥ、ＰＶＤＦ、ＰＶＦ等が挙げられる。

【０１６０】これらのフッ素樹脂粒子の粒径は、０．１～１０μｍが好ましい。これより過大でも過小でも、十分な潤滑性を得ることができない。また、これらの粒子が分散される潤滑性発熱層５の層厚が１０μｍよりも薄い場合、粒子の最大粒径はこの層厚を越えないのが好ましい。粒径が層厚よりも大きいと、表面に粒子の凹凸が発生し、定着ニップ部Ｎでの圧接により定着フィルム１０が変形してしまう恐れがある。

【０１６１】フッ素樹脂粒子の含有量は必要に応じて適宜設定することができるが、２～４０体積％が好ましい。２体積％以下であると、分散させた粒子による潤滑性向上の効果があまり認められない。また、粒子の含有量が４０体積％を越えると、得られる複合めっき被膜が脆くなり、可撓性が低下するだけでなく、発熱効率が不十分になる。

【０１６２】３）効　果

本実施例の定着フィルム１０の構成は、離型層１としてＰＦＡ３０μｍ、弾性層２としてシリコーンゴム３００μｍ、潤滑性発熱層５として、平均粒径約１μｍのＰＴＦＥ粒子をニッケル内に２７体積％分散させた複合めっき６０μｍからなる。

【０１６３】フッ素樹脂は、他の合成樹脂に比べて、非常に摩擦係数が小さいため、潤滑性に富むものである。これを金属マトリックス中に分散させた潤滑性発熱層５を設けることで、定着フィルム１０の内周面の潤滑性を向上させる。

【０１６４】本実施例の定着フィルム１０についても、実施例１と同様な評価を行った。

【０１６５】実施例１での比較と同様に、比較例は図１２に示すように、内周面がニッケルの発熱層３を有する構成の定着フィルム１０である。比較例の定着フィルム１０では、そのままだと摺動抵抗が高く、安定した紙搬送が実現できなかったため、潤滑剤として耐熱グリース約１ｇをフィルムガイド接触面側に塗布している。

【０１６６】本実施例の効果は、実施例１と同様に、Ａ４サイズ紙１０万枚通紙耐久における定着装置の駆動トルクとスリップ発生率を評価することで確認した。通紙速度および通紙中の温調温度、また駆動トルクとスリップ発生率の測定方法は、実施例１と同様である。

【０１６７】この結果を表１の実施例２の箇所に示す。

【０１６８】本実施例では、耐久初期において、潤滑剤を塗布せずに、比較例とほぼ同等の駆動トルクを実現できる。

【０１６９】さらに、１０万枚通紙後においても、駆動トルクの増加が＋０．２ｋｇｆ・ｃｍと、比較例の＋２．３ｋｇｆ・ｃｍに比べて軽微であり、通紙初期の駆動トルクをほぼ維持していることが分かる。

【０１７０】また本実施例では、スリップも耐久初期と終盤で発生することはなかったが、比較例では耐久終盤においてスリップが１３１／５０００の確率で発生した。

【０１７１】このように、本実施例の定着フィルム１０によって終始安定した被記録材の搬送を実現することができる。

【０１７２】〈第３の実施例〉（図１０）

次に第３の実施例について説明する。以下に述べる定着

フィルム10を除き、定着装置・画像形成装置の構成は実施例1と同様であるので、これらについての説明は省略する。以下に本実施例の定着フィルム10の構成を説明する。

【0173】1)定着フィルム10

図10は、本実施例の定着フィルム10の構成を示す横断面概略図である。

【0174】本実施例の定着フィルム10は、定着フィルム内周面に、単一金属もしくは合金マトリックス中にセラミックス粒子を分散させた金属層4と、その外周面に単一金属もしくは合金からなる金属層3を積層させたことを特徴とするものである。

【0175】ここでは、前者の金属層4を主に定着フィルム10内周面の潤滑作用を有するので潤滑層、後者の金属層3を電磁誘導発熱作用を有するので発熱層と呼ぶ。

【0176】また潤滑層4も、分散粒子のマトリックスに金属を用いているので、多少の発熱作用を有する。

【0177】本実施例の定着フィルム10は、発熱作用部と潤滑作用部を分離しているため、分散粒子による電磁誘導発熱作用の阻害を受け難い。そのため、潤滑層4に分散される粒子の含有量の上限値を、実施例1と同2で述べた潤滑性発熱層5よりも多くすることができる。よって、発熱効率を犠牲にすることなく、定着フィルム10の内周面の潤滑性をより高めることができる。

【0178】2)発熱層3

離型層1、弾性層2の材質及び層厚は、実施例1と同様であるので、これらについての説明は省略する。

【0179】発熱層3はニッケル、鉄、強磁性SUS、ニッケル−コバルト合金といった強磁性体の金属を用いるとよい。非磁性の金属でも良いが、より好ましくは磁束の吸収の良いニッケル、鉄、磁性ステンレス、コバルト−ニッケル合金等の金属が良い。また、定着フィルム10回転時に受ける繰り返しの屈曲応力による金属疲労を防ぐために、ニッケル中にマンガンを添加するのも良い。

【0180】その厚みは次の式で表される表皮深さより厚くかつ200μm以下にすることが好ましい。表皮深さσ[m]は、励磁回路の周波数f[Hz]と透磁率μと固有抵抗ρ[Ωm]で

$\sigma=503\times(\rho/f\mu)^{1/2}$

と表される。

【0181】これは電磁誘導で使われる電磁波の吸収の深さを示しており、これより深いところでは電磁波の強度は1/e以下になっていることを示す。逆にいうと殆どのエネルギーはこの深さまでで吸収されている(図9)。

【0182】発熱層3の厚さは好ましくは1μm以上がよい。発熱層3の厚みが1μmよりも薄いと、ほとんどの電磁エネルギーが吸収しきれないため効率が悪くなる。また、発熱層3と潤滑層4の和が100μm以下になるように、発熱層3の層厚を設定するのが良い。発熱層3と潤滑層4の和が100μmを超えると剛性が高くなりすぎ、また屈曲性が悪くなり回転体として使用するには現実的ではない。

【0183】3)潤滑層4

潤滑層4を構成するマトリックスは金属であり、ニッケル、鉄、強磁性SUS、ニッケル−コバルト合金といった強磁性金属もしくは、アルミニウムといった非磁性金属でも良い。また、定着フィルム10の耐久性向上に着目して、ニッケル−リンやニッケル−リン−ボロン等の耐摩耗性の高い合金でも良い。また、定着フィルム10回転時に受ける繰り返しの屈曲応力による金属疲労を防ぐために、ニッケル中にマンガンを添加するのも良い。このような金属を用いることで、定着フィルム10の耐久性が向上する。

【0184】マトリックスに金属を用いるので、潤滑層4に発熱層としての作用も付加することができるが、強磁性金属を用いた方が非磁性金属よりも高効率に電磁誘導発熱させることができる。

【0185】よって、好ましくは、潤滑層4のマトリックス金属は強磁性金属が良く、さらに好ましくは、電解めっきや無電解めっきによる作製が比較的容易なニッケルもしくはニッケル基合金が良い。

【0186】潤滑層4は、これらの金属マトリックス中にセラミックス粒子を分散させて、フィルム内周面の潤滑性向上をねらったものである。

【0187】このセラミックス粒子は、摩擦係数の低いものが良く、自己潤滑性の高いセラミックスが良い。自己潤滑性の高いセラミックスとしては、結晶構造が六方格子で層状構造をなす窒化ホウ素・グラファイト・二硫化モリブデンが良い。このうち電解めっきで潤滑層4を作成する場合、電鋳内に分散させやすいものである窒化ホウ素がより好ましい。

【0188】また、セラミックス粒子を分散させることにより、潤滑層4の耐摩耗性も向上させることができる。

【0189】よって、定着フィルム10の内周面の摺動抵抗と金属の摩耗による削れ粉を低減できるので、長期にわたり定着フィルム10と良熱伝導部材40・フィルム支持部材16の摺動抵抗を低減させることができるこれらのセラミックス粒子の粒径は、0.1〜10μmが好ましい。これより過大でも過小でも、十分な潤滑性を得ることができない。また、これらの粒子が分散される潤滑層4の層厚が10μmよりも薄い場合、粒子の最大粒径はこの層厚を越えないのが好ましい。粒径が層厚よりも大きいと、表面に粒子の凹凸が発生し、定着ニップ部Nでの圧接により定着フィルム10が変形してしまう恐れがある。

【0190】セラミックス粒子の含有量は必要に応じて

適宜設定することができるが、０．２～３０重量％が好ましい。０．２重量％以下であると、分散させたセラミックス粒子による潤滑性・耐摩耗性向上の効果があまり認められない。また、セラミックス粒子の含有量が３０重量％を越えると、得られる複合めっき被膜が脆くなり、可撓性が低下するため、好ましくない。

【０１９１】本実施例の定着フィルム１０は、発熱作用部と潤滑作用部を分離しているため、分散されたセラミックス粒子による電磁誘導発熱作用の阻害が、実施例１で述べた潤滑性発熱層５の場合よりも小さい。

【０１９２】そのため、本実施例の潤滑層４のセラミック粒子含有量の上限値は、実施例１で述べた潤滑性発熱層５における値（２０重量％）よりも多く設定できる。

【０１９３】以上に述べた潤滑層４は、電解めっき法により得られた複合電鋳である。実施例１と同様なめっき条件により、作製した。

【０１９４】４）効　果

本実施例の定着フィルム１０は、離型層１としてＰＦＡ３０μｍ、弾性層２としてシリコーンゴム３００μｍ、発熱層３としてニッケル４５μｍ、潤滑層４として平均粒径１μｍの窒化ホウ素粒子をニッケル内に分散させた複合めっき１５μｍからなる構成である。

【０１９５】本実施例の定着フィルム１０の内周面である潤滑層４は、実施例１の定着フィルム１０の内周面の潤滑性発熱層５と同様の構成である。この潤滑層４は、定着フィルム１０の内周面の潤滑性を向上させ、定着フィルム１０の回転時の摺動抵抗を低減し、定着装置の駆動トルクを低減することができる。

【０１９６】よって、本実施例の定着フィルム１０においても、実施例１と同様に、終始安定した被記録材の搬送を実現できる。

【０１９７】〈第４の実施例〉次に第４の実施例について説明する。以下に述べる定着フィルム１０を除き、定着装置・画像形成装置の構成は実施例１と同様であるので、これらについての説明は省略する。以下に、本実施例の定着フィルム１０について説明する。

【０１９８】１）定着フィルム１０

本実施例の定着フィルム１０も、実施例３と同様に、定着フィルム１０の内周面に潤滑作用を有する潤滑層４を設け、その外周面に発熱層３を積層させたことを特徴とするものである。

【０１９９】実施例３と異なる点は、潤滑層４に分散させる粒子を合成樹脂としたことである。

【０２００】この合成樹脂に、実施例３で用いた自己潤滑性のあるセラミックスよりも摩擦係数が小さいフッ素樹脂を用いることで、さらに潤滑層４の潤滑性を向上させることができる。

【０２０１】また、実施例３のセラミックス粒子を分散させた場合よりも、潤滑層４の内周面の硬度を低くすることができる。例えば、定着フィルム１０の内周面と摺動する良熱伝導部材４０・フィルム支持部材１６の材質の硬度が潤滑層４よりも低い場合に、その硬度差をより小さくすることができるので、良熱伝導部材４０・フィルム支持部材１６の摩耗を低減することができる。ひいては、摺動抵抗の低減につながる。

【０２０２】２）潤滑層４

潤滑層４を除き、離型層１、弾性層２、発熱層３については実施例３と同様であるので、これらについての説明は省略する。

【０２０３】フッ素樹脂は、他の合成樹脂に比べて、非常に摩擦係数が小さいため、潤滑性に富むものである。これを金属マトリックス中に分散させた潤滑層４を設けることで、定着フィルム１０の内周面の潤滑性を向上させる。

【０２０４】実施例３と同様に、潤滑層４を構成するマトリックス金属としては、ニッケル、鉄、強磁性ＳＵＳ、ニッケル－コバルト合金といった強磁性金属、もしくはアルミニウムといった非磁性金属でも良い。また、定着フィルム１０の耐久性向上に着目して、ニッケル－リンやニッケル－リン－ボロン等の耐摩耗性の高い合金でも良い。また、定着フィルム１０回転時に受ける繰り返しの屈曲応力による金属疲労を防ぐために、ニッケル中にマンガンを添加するのも良い。このような金属を用いることで、定着フィルム１０の耐久性が向上する。

【０２０５】マトリックスに金属を用いるので、潤滑層４に発熱層としての作用も付加することができるが、強磁性金属を用いた方が非磁性金属よりも高効率に電磁誘導発熱させることができる。

【０２０６】よって、好ましくは、潤滑層４のマトリックス金属は強磁性金属が良く、さらに好ましくは、電解めっきや無電解めっきによる作製が比較的容易なニッケルもしくはニッケル基合金が良い。

【０２０７】本実施例の潤滑層４は、上述のマトリックス金属中にフッ素樹脂を分散させたものである。

【０２０８】このフッ素樹脂としては、例えば、ＰＦＡ、ＦＥＰ、ＰＴＦＥ、ＥＴＦＥ、ＰＣＴＦＥ、ＥＣＴＦＥ、ＰＶＤＦ、ＰＶＦ等が挙げられる。

【０２０９】これらのフッ素樹脂粒子の粒径は、０．１～１０μｍが好ましい。これより過大でも過小でも、十分な潤滑性を得ることができない。また、これらの粒子が分散される潤滑層４の層厚が分散される潤滑層４の層厚が１０μｍよりも薄い場合、粒子の最大粒径はこの層厚を越えないのが好ましい。粒径が層厚よりも大きいと、表面に粒子の凹凸が発生し、定着ニップ部Ｎでの圧接により定着フィルム１０が変形してしまう恐れがある。

【０２１０】フッ素樹脂粒子の含有量は必要に応じて適宜設定することができるが、２～５０体積％が好ましい。２体積％以下であると、分散させた粒子による潤滑性向上の効果があまり認められない。また、粒子の含有

量が５０体積％を越えると、得られる複合めっき被膜が脆くなり、可撓性が低下するため、好ましくない。

【０２１１】本実施例の定着フィルム１０は、発熱作用部と潤滑作用部を分離しているため、分散されたフッ素樹脂粒子による電磁誘導発熱作用の阻害が、実施例１で述べた潤滑性発熱層５の場合よりも小さい。

【０２１２】そのため、本実施例の潤滑層４のフッ素樹脂粒子含有量の上限値は、実施例１で述べた潤滑性発熱層５における値（４０体積％）よりも多く設定できる。

【０２１３】３）効　果

本実施例の定着フィルム１０は、離型層１としてＰＦＡ３０μｍ、弾性層２としてシリコーンゴム３００μｍ、発熱層３としてニッケル４５μｍ、潤滑層４として平均粒径１μｍのＰＴＦＥ粒子をニッケル内に分散させた複合めっき１５μｍからなる構成とした。

【０２１４】本実施例の定着フィルム１０の内周面である潤滑層４は、実施例２の定着フィルム１０内周面の潤滑性発熱層５と同様の構成である。この潤滑層４は、定着フィルム１０の内周面の潤滑性を向上させ、定着フィルム１０の回転時の摺動抵抗を低減し、定着装置の駆動トルクを低減することができる。

【０２１５】よって、本実施例の定着フィルム１０においても、実施例１と同様に、終始安定した被記録材の搬送を実現できる。

【０２１６】〈その他〉

１）潤滑性発熱層５または潤滑層４は金属マトリックス中にセラミックス粒子と合成樹脂粒子の両者の混合物を分散させて構成することもできる。

【０２１７】２）定着ニップ部Ｎにおける良熱伝導部材４０の下面と定着フィルム１０の内周面との相互摺動摩擦力を低減化させるために定着ニップ部Ｎの良熱伝導部材４０の下面と定着フィルム１０の内周面との間に耐熱性グリスなどの潤滑剤を介在させる、あるいは良熱伝導性部材４０の下面を潤滑部材で被覆することもできる。これは、良熱伝導部材４０としてアルミニウムを用いた場合のように表面の滑り性が材質的によくない或いは仕上げ加工を簡素化した場合に、摺動する定着フィルム１０に傷をつけて定着フィルム１０の耐久性が悪化してしまうことを防ぐものである。

【０２１８】以上述べてきた全ての実施例において、上記の潤滑剤塗布や潤滑部材によって、さらに駆動トルク低減と長寿命化を図ることができる。

【０２１９】３）また、各実施例における定着装置は、加熱部材としてのエンドレスベルト状の定着フィルムを複数の部材間に懸回張設して駆動手段で回転させる構成、ロール巻きにした有端の長尺の定着フィルムを繰り出して走行させる構成などにすることもできる。

【０２２０】４）定着フィルム１０は、モノクロあるいは1パスマルチカラー画像などの加熱定着用の場合は弾性層２を省略した形態のものとすることもできる。また離型層１も省略した形態のものとすることもできる。他の所望の機能層を追加した層構成のものとすることもできる。

【０２２１】５）加圧部材３０はローラに限らず、回動ベルト型など他の形態の部材にすることもできる。

【０２２２】また加圧部材３０側からも被記録材に熱エネルギーを供給するために、加圧部材３０側にも電磁誘導加熱などの発熱手段を設けて所定の温度に加熱・温調する装置構成にすることもできる。

【０２２３】６）本発明の加熱装置は実施例の画像加熱定着装置としてに限らず、画像を担持した被記録材を加熱してつや等の表面性を改質する像加熱装置、仮定着する像加熱装置、その他の被加熱材を乾燥やラミネート等の熱処理する装置などとして広く活用できる。

【０２２４】

【発明の効果】以上説明したように本発明によれば、一方の面が支持部材と摺動し他方の面が被加熱部材と接して被加熱部材を加熱する、金属層を有する加熱部材、および該加熱部材を有する加熱装置において、加熱部材の支持部材と摺動する面にセラミック粒子もしくは合成樹脂の少なくとも一方を金属マトリックス中に分散させた金属層を設けたことで、加熱部材の支持部材との摺動面の摺動抵抗を低減し、さらに通紙耐久による摺動抵抗の増加を抑制することが出来る。

【０２２５】よって、被加熱部材のスリップを防止できるので、安定した被加熱部材の搬送を確保することができ、画像加熱定着装置にあっては、高品位な画像と安定した被記録材の搬送を提供することが可能となる。

【０２２６】さらに、加熱装置の駆動モータとして、駆動トルクのより小さなものを使用することができるので、製品コストの低減につながる。

【図面の簡単な説明】

【図１】　第１の実施例における画像形成装置の概略構成模型図

【図２】　定着装置の要部の横断側面模型図

【図３】　同じく要部の正面模型図

【図４】　同じく要部の縦断模型図

【図５】　内部に励磁コイルと磁性コアを配設支持させた右側のフィルムガイド部材の斜視模型図

【図６】　磁場発生手段と発熱量の関係を示した図

【図７】　安全回路図

【図８】　加熱部材としての電磁誘導発熱性定着フィルムの層構成模型図

【図９】　発熱層深さと電磁波強度の関係を示したグラフ

【図１０】　第3の実施例における加熱部材としての電磁誘導発熱性定着フィルムの層構成模型図

【図１１】　電磁誘導発熱方式の加熱装置（画像加熱定着装置）の一例の概略構成模型図

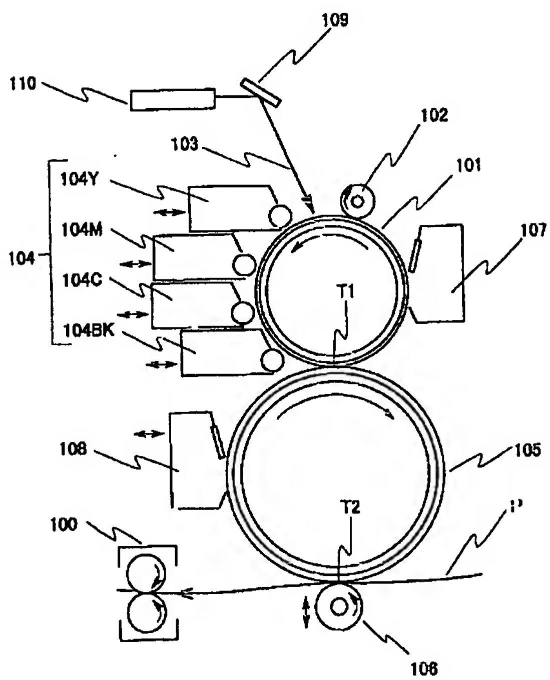
【図１２】　加熱部材としての電磁誘導発熱性定着フィ

ルムの層構成模型図

【符号の説明】

１…離型層、２…弾性層、３…発熱層、４…潤滑層、５…潤滑性発熱層、１０…定着フィルム、１６…フィルム支持部材、１７…励磁コア、１８…励磁コイル、２２…加圧用剛性ステイ、２３…フランジ部材、２５…加圧バネ、２６…温度センサ、２７…励磁回路、３０…加圧ローラ、４０…良熱伝導部材、５０…サーモスイッチ、５１…リレースイッチ、１００…定着装置、１０１…感光ドラム、１０２…帯電装置、１０３…レーザー光、１０４…現像器、１０５…中間転写ドラム、１０６…転写ローラ、１０７…クリーナ、C…交番磁束、H…発熱位置、M…駆動手段、N…定着ニップ部、P…被記録材、t…トナー、T１…一次転写部、T２…二次転写部

【図１】



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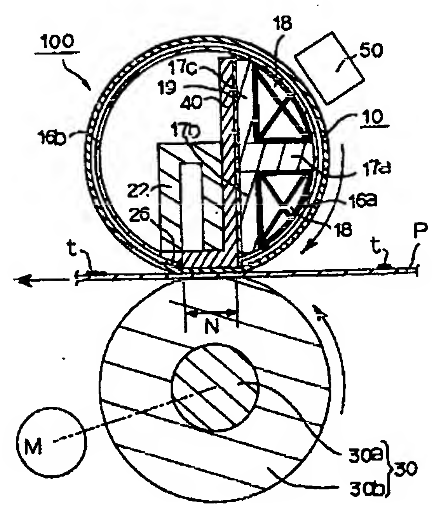

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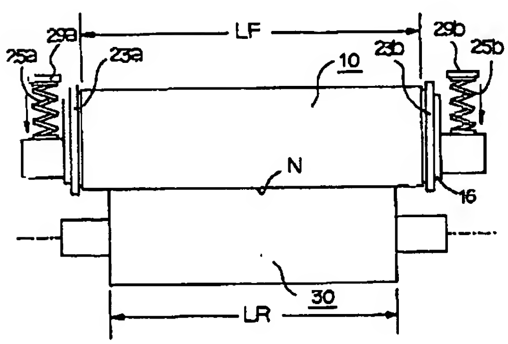

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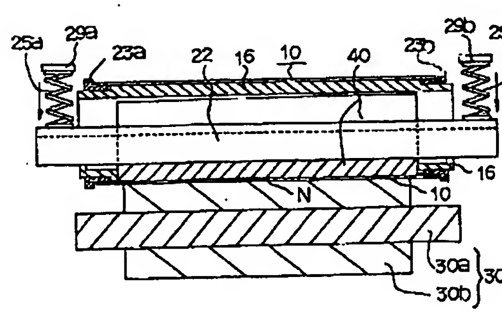

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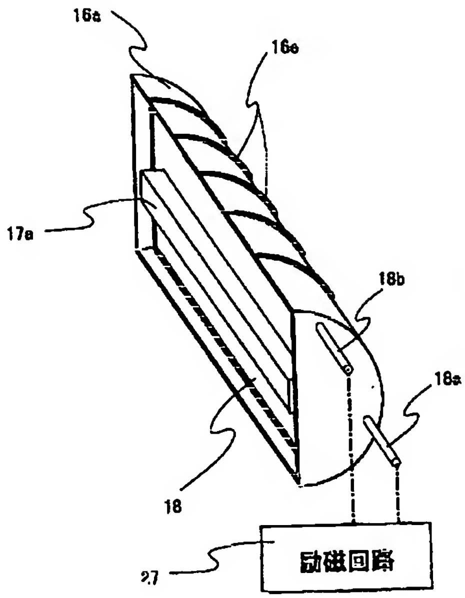

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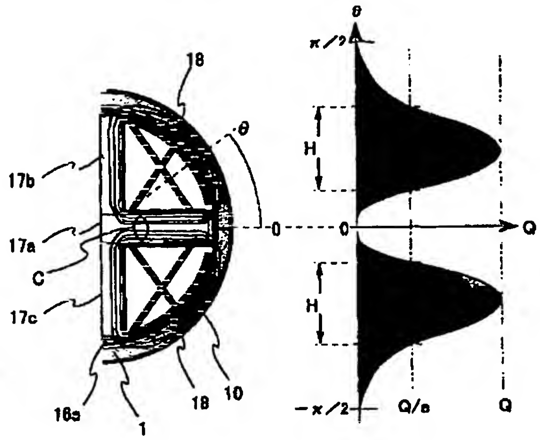

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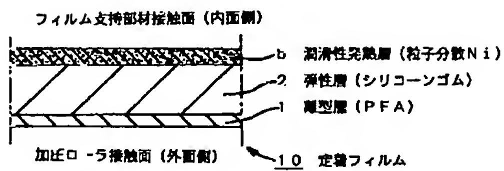

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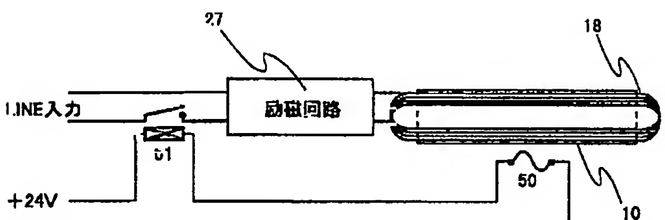

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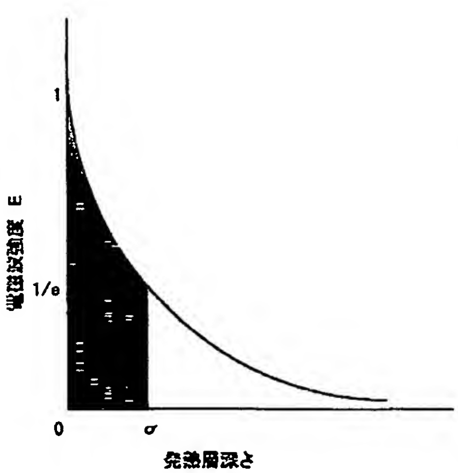

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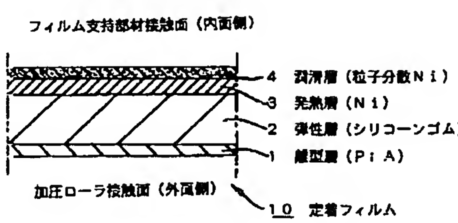

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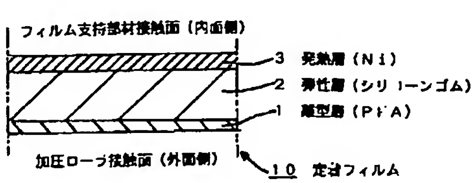

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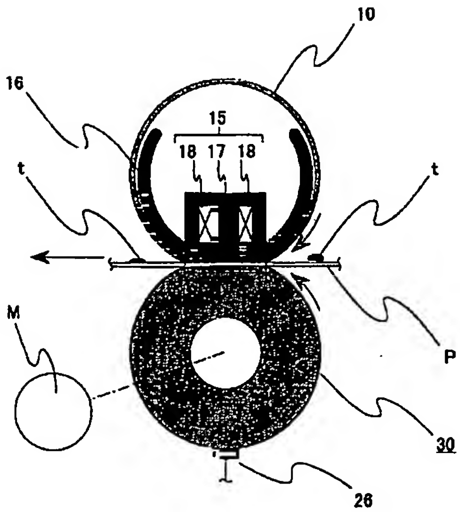

フロントページの続き

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AC33 AD07 AD15 AD34 AD35
CD44

CLAIMS

[Claim(s)]
[Claim 1] The heating component which is a heating component to which one field slides with supporter material and the field of another side heats a heated member in contact with a heated member, and is characterized by preparing the metal layer which distributed either [at least] the ceramic particle or the synthetic-resin particle in the metal matrix in supporter material and the field on which it slides.
[Claim 2] It is the heating component to which one field slides with supporter material and the field of another side heats a heated member in contact with a heated member. It is the heating component which prepares the metal layer which distributed either [at least] the ceramic particle or the synthetic-resin particle in the metal matrix in supporter material and the field on which it slides, and is characterized by the supporter material side of this layer carrying out the laminating of the metal layer which consists of a single metal or an alloy at an opposite side side further.
[Claim 3] It is the heating component according to claim 1 which the ceramic particle distributed in said metal matrix consists of at least one kind in the graphite which also spreads boron nitride, or molybdenum disulfide, and is characterized by the particle size being 0.1-10 micrometers.
[Claim 4] It is the heating component according to claim 2 which the ceramic particle distributed in said metal matrix consists of at least one kind in the graphite which also spreads boron nitride, or molybdenum disulfide, and is characterized by the particle size being 0.1-10 micrometers.
[Claim 5] The heating component according to claim 1 or 3 characterized by all the contents of a ceramic particle being 0.2 - 20 % of the weight in the metal layer by which said ceramic particle is distributed in said metal matrix.
[Claim 6] The heating component according to claim 2 or 4 characterized by all the contents of a ceramic particle being 0.2 - 30 % of the weight in the metal layer by which said ceramic particle is distributed in said metal matrix.
[Claim 7] It is the heating component according to claim 1 which the synthetic-resin particle distributed in said metal matrix consists of a fluororesin, and is characterized by the particle size being 0.1-10 micrometers.
[Claim 8] It is the heating component according to claim 2 which the synthetic-resin particle distributed in said metal matrix consists of a fluororesin, and is characterized by the particle size being 0.1-10 micrometers.
[Claim 9] The heating component according to claim 1 or 7 characterized by all the contents of a synthetic-resin particle being two to 40 volume %s in the metal layer by which said synthetic-resin particle is distributed.
[Claim 10] The heating component according to claim 2 or 8 characterized by all the contents of a synthetic-resin particle being two to 50 volume %s in the metal layer by which said synthetic-resin particle is distributed.
[Claim 11] The metal matrix by which said particle is distributed is a heating component given in any of claims 1-10 characterized by being nickel or a nickel radical alloy they are.
[Claim 12] A heating component given in any of claims 1-11 characterized by having the layer which carries out electromagnetic-induction generation of heat according to an operation of an alternating magnetic field they are.
[Claim 13] A heating component given in any of claims 1-12 characterized by having a mold release layer on the front face by the side of a heated member they are.
[Claim 14] A heating component given in any of claims 1-13 characterized by being body of revolution they are.
[Claim 15] A heating component given in any of claims 1-13 characterized by being endless film-like body of revolution they are.

[Claim 16] Heating apparatus characterized by having a heating component given [as a heating component which heats a heated member] in any of claims 1-15 they are.
[Claim 17] Heating apparatus characterized by a heating component being a heating component given in any of claims 1-15 they are in the heating apparatus which has the heating component to which one field slides with supporter material, and the field of another side touches a heated member, and heats a heated member by this heating component.
[Claim 18] Heating apparatus characterized by a heating component being a heating component given in any of claims 1-15 they are in the heating apparatus which has the heating component to which one field slides with supporter material, and the field of another side touches a heated member, and the pressurization member which carries out a pressure welding to supporter material through this heating component, and forms nip, carries out pinching conveyance of the heated member between the heating component of said nip section, and a pressurization member, and heats a heated member by the heating component.
[Claim 19] Said heating component is heating apparatus according to claim 18 characterized by following and driving to a pressurization member or a pressure-welding member by friction of the front face of the pressure-welding member and heating component which carry out a pressure welding to said pressurization member or a heating component peripheral face.
[Claim 20] Heating apparatus given in any of claims 16-19 characterized by for said heated member being a recorded material which supported the non-established toner image, and carrying out heat fixing of the non-established toner image by the heat of a heating component at a recorded material they are.
[Claim 21] Heating apparatus given in any of claims 16-20 characterized by having a means to make an alternating magnetic field act and to carry out electromagnetic-induction generation of heat of said heating component they are.
[Claim 22] Image formation equipment characterized by a heating fixing means being heating apparatus given in any of claims 16-21 they are in the image formation equipment which has an image formation means to form a non-established toner image in a recorded material, and a heating fixing means to make a recorded material carry out heat fixing of the non-established toner image.
[Claim 23] Said image formation equipment is image formation equipment according to claim 22 characterized by color picture formation being possible.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to a heating component, heating apparatus, and image formation equipment.
[0002] It is related with the heating apparatus equipped with the heating component to which one field slides with supporter material and the field of another side heats a heated member in contact with a heated member in more detail, and this heating component as a heating means of a heated member, and the image formation equipment equipped with this heating apparatus as image heating anchorage devices.
[0003] the image heating apparatus (a heating anchorage device --) which makes a recorded material carry out heat fixing of the non-established image which made the recorded material carry out formation support of the heating apparatus for example, in image formation equipment as a permanent fixing image in this invention They are a heating fixing assembly, the image heating apparatus to which assumption arrival of the non-established image is heated and carried out, the image heating apparatus which heats the recorded material which supported the image and reforms front-face nature, such as gloss, and equipment which heat-treats [lamination / desiccation,] other heated material.
[0004]
[Description of the Prior Art] Hereafter, the image heating anchorage device of image formation equipment is made into an example, and is explained.
[0005] Conventionally, in image formation equipment, the equipment of a heat mechanical control by roller is widely used as an anchorage device which makes a recorded material side carry out heating fixing of the non-established toner image which carried out formation support indirectly [a recorded material] or directly with the proper image formation process means as a permanent fixing image. In recent years, although the equipment of a film heating method is put in practical use from the quick start or a viewpoint of energy saving, the equipment of the electromagnetic-induction heating method which makes the film itself which consists of a metal as a still more efficient anchorage device generate heat is proposed.
[0006] JP,51-109739,U is made to guide an eddy current to the metal layer of the fixing film as a heating component (heating element) by the alternating magnetic field, and the induction-heating anchorage device made to generate heat with the Joule's heat is indicated. This could make the direct fixing film generate heat by using generating of the induced current, and has attained the fixing process more efficient than the anchorage device of the heat mechanical control by roller which makes a halogen lamp a heat source.
[0007] However, since the energy of the alternate magnetic flux generated with the exiting coil as a magnetic field generating means is used for the temperature up of the whole fixing film, its heat loss is large. Therefore, the rate of the energy which acts on fixing to the supplied energy was low, and there was a fault that effectiveness was bad.
[0008] Then, in order are efficient and to obtain the energy which acts on fixing, the exiting coil was made to approach the fixing film which is a heating component, or alternate-magnetic-flux distribution of an exiting coil was centralized near the fixing nip section, and the efficient anchorage device was devised.
[0009] The outline configuration of an example of the anchorage device of the electromagnetic-induction heating method which made the fixing nip section concentrate alternate-magnetic-flux distribution of an exiting coil on drawing 11 , and raised effectiveness is shown.
[0010] 10 is the fixing film of the shape of a cylinder as a heating component which has an electromagnetic-induction exoergic layer (a conductor layer, a magnetic layer, resistor layer).

[0011] 16 is cross-section abbreviation half circular ** type film supporter material, and makes the outside of this film supporter material 16 have carried out outer fitting of the cylindrical fixing film 10 loosely.
[0012] 15 is the magnetic field generating means arranged inside the film supporter material 16, and consists of an exiting coil 18 and a magnetic core (core material) 17 of E mold.
[0013] 30 is an elastic pressurization roller, it makes the fixing film 10 insert, makes the fixing nip section N of predetermined width of face (heating nip section) form with the inferior surface of tongue of the film supporter material 16, and predetermined contact pressure, and has carried out the mutual pressure welding. The magnetic core 17 of said magnetic field generating means 15 is made to correspond to the fixing nip section N, and is arranged.
[0014] The rotation drive of the pressurization roller 30 is carried out by the driving means M at the counterclockwise rotation of ****. By the rotation drive of this pressurization roller 30, turning effort acts on the fixing film 10 by the frictional force of said pressurization roller 30 and external surface of the fixing film 10. Said fixing film 10 rotates the periphery of the film supporter material 16 with the peripheral velocity corresponding to the peripheral velocity of the pressurization roller 30 of **** mostly clockwise, while the inside sticks to the inferior surface of tongue of the film supporter material 16 and slides in the fixing nip section N (pressurization roller drive method).
[0015] The film supporter material 16 carries out the duty which plans conveyance stability at the time of the pressurization to the fixing nip section N, the exiting coil 18 as a magnetic field generating means 15 and support of the magnetic core 17, support of the fixing film 10, and rotation of the fixing film 10. This film supporter material 16 is an insulating member which does not bar passage of magnetic flux, and the ingredient which can bear a high load is used.
[0016] The schematic diagram of the lamination of the fixing film 10 as a heating component is shown in drawing 12 . The fixing film 10 is a complex film which has the mold release layer 1, the elastic layer 2, and the exoergic layer 3 in order inside from an outside. The mold release layer 1 consists of good fluororesins of mold-releases characteristic, such as PFA, etc. The elastic layer 2 consists of synthetic rubber which is rich in the elasticity of silicone rubber etc. The exoergic layer 3 is a layer which carries out self-generation of heat according to the eddy current by electromagnetic induction, and consists of ferromagnetic metals, such as nickel. Although non-magnetic metal may be used for this exoergic layer 3, exoergic effectiveness falls compared with the case where a ferromagnetic metal is used.
[0017] An exiting coil 18 generates alternate magnetic flux according to the alternation current supplied from a non-illustrated excitation circuit. Alternate magnetic flux is intensively distributed over the fixing nip section N with the magnetic core 17 of E mold corresponding to the location of the fixing nip section N, and the alternate magnetic flux makes the exoergic layer 3 of the fixing film 10 generate an eddy current in the fixing nip section N. This eddy current makes the exoergic layer 3 generate the Joule's heat with the specific resistance of an electromagnetic-induction exoergic layer.
[0018] Electromagnetic-induction generation of heat of this fixing film 10 is intensively produced in the fixing nip section N over which alternate magnetic flux was distributed intensively, and the fixing nip section N is heated efficient.
[0019] Temperature control of the temperature of the fixing nip section N is carried out so that temperature predetermined by the current supply source to an exiting coil 18 being controlled by the temperature control control system including a temperature detection means (un-illustrating) may be maintained.
[0020] It **, the rotation drive of the pressurization roller 30 is carried out, the fixing film 10 of the shape of a cylinder as a heating component rotates the periphery of the film supporter material 16 in connection with it, electromagnetic-induction generation of heat of the fixing film 10 is made as mentioned above by the electric supply to the exiting coil 18 from an excitation circuit, and the fixing nip section N starts to predetermined temperature. And the recorded material P with which the non-established toner image t conveyed from the image formation means section (un-illustrating) was formed in the condition that temperature control was carried out Between the fixing film 10 of the fixing nip section N, and the pressurization roller 30, upward, i.e., a fixing film plane, an image side counters, and is introduced, in the fixing nip section N, an image side sticks to the external surface of the fixing film 10, and pinching conveyance is carried out in the fixing nip section N together with the fixing film 10. In the process in which pinching conveyance of the recorded material P is carried out together with the fixing film 10 in this fixing nip section N, the fixing film 10 is heated and heating fixing of the non-established toner image t on a recorded material P is carried out. After passing the fixing nip

section N, from the peripheral face of the fixing film 10, a recorded material P separates and is conveyed.
[0021]
[Problem(s) to be Solved by the Invention] However, there were the following problems in the anchorage device of a configuration of that the inner skin of the fixing film 10 as a heating component which was stated above slides with the front face of the film supporter material 16.
[0022] That is, in order that the inside of said fixing film 10 and the front face of the film supporter material 16 may carry out rubbing of the time of rotation of the fixing film 10 in the fixing nip section N, the sliding nature between the inside of the fixing film 10 and the front face of the film supporter material 16 influences the driving torque of an anchorage device greatly. If this sliding nature is bad in pressurization roller 30 drive, the sliding friction of the fixing film 10 and the film supporter material 16 will become large, and it will especially be easy to generate a slip between the fixing film 10 and the pressurization roller 30 of a drive means of communication. It is easy to generate a slip between the recorded materials P and the pressurization rollers 30 which are especially conveyed with the fixing film 10 at the time of ****.
[0023] This sliding friction is so large that the welding pressure concerning the fixing nip section N is large. When using especially as an anchorage device of full color image formation equipment with much toner ******, in order to raise fixable, it is necessary to enlarge welding pressure and to take large nip width of face from the anchorage device of mono-color picture formation equipment. Moreover, in order to raise the permeability of the color toner image on an OHP film, it is necessary to enlarge welding pressure, to make higher planar pressure in the fixing nip section N, and to graduate a toner image front face. Thus, if it is used as an anchorage device of full color image formation equipment, since welding pressure is high, a sliding friction will be large and it will become remarkable slip generating it.
[0024] When a slip is generated at the time of **** of the recorded material P which carried the toner image t, the toner image t is disturbed by superfluous heat supply and a superfluous slip, and the remains of a slip occur on an image. Moreover, it is easy to generate a jam with this slip, without the ability of the delivery timing of the recorded material P in an anchorage device delivering paper well behind time. Furthermore, since the big driving torque to the drive motor of an anchorage device was required so that the sliding friction at the time of rotation of the fixing film 10 is large, there was a problem on which the cost of a drive motor goes up.
[0025] In order to solve the above problems, there is a method of making the sliding friction at the time of rotation of the fixing film 10 mitigate by making lubricant, such as high temperature grease, intervene between the inner skin of the fixing film 10, and the film supporter material 16 as proposed by JP,5-27619,A.
[0026] However, if it continues using high temperature grease under an elevated temperature like the interior of an anchorage device, grease will deteriorate, or the amount of grease distributed over the fixing nip section N which is the sliding section will decrease, and lubricity will be lost. furthermore, the crack at the time of sliding of the metal layer of the inner skin of the fixing film 10 depended for the ability deleting -- the -- it can delete and lubricity is lost also for powder. Thus, even if it applies high temperature grease, the condition that a sliding friction is low does not last long, but has the inclination which a sliding friction increases gradually. Therefore, there was a problem on which conveyance of a recorded material P becomes unstable, slips of a recorded material P occur frequently, and the jams in a poor image and an anchorage device occur frequently, so that it continued using an anchorage device.
[0027] Therefore, it is necessary to raise the lubricity of the inside of the fixing film 10 as a heating component, or the front face of film supporter material 16 the very thing, without depending on spreading of said lubricant.
[0028] Then, this invention reduces a sliding friction with the supporter material of the heating component to which one field slides with supporter material and the field of another side heats a heated member in contact with a heated member, and aims at controlling the increment in the sliding friction by **** durability further.
[0029]
[The means which invention is going to solve] This invention is the heating component, heating apparatus, and image formation equipment which are characterized by the configuration described below.
[0030] (1) The heating component which is a heating component to which one field slides with supporter material and the field of another side heats a heated member in contact with a heated member, and is characterized by preparing the metal layer which distributed either [at least] the ceramic particle or the synthetic-resin particle in the metal matrix in supporter material and the field on which it slides.
[0031] (2) It is the heating component to which one field slides with supporter material and the field of another side heats a heated member in contact with a heated member. It is the heating component which prepares the

metal layer which distributed either [at least] the ceramic particle or the synthetic-resin particle in the metal matrix in supporter material and the field on which it slides, and is characterized by the supporter material side of this layer carrying out the laminating of the metal layer which consists of a single metal or an alloy at an opposite side side further.
[0032] (3) It is a heating component given in (1) which the ceramic particle distributed in said metal matrix consists of at least one kind in the graphite which also spreads boron nitride, or molybdenum disulfide, and is characterized by the particle size being 0.1-10 micrometers.
[0033] (4) It is a heating component given in (2) which the ceramic particle distributed in said metal matrix consists of at least one kind in the graphite which also spreads boron nitride, or molybdenum disulfide, and is characterized by the particle size being 0.1-10 micrometers.
[0034] (5) A heating component given in (1) characterized by all the contents of a ceramic particle being 0.2 - 20 % of the weight in the metal layer by which said ceramic particle is distributed in said metal matrix, or (3).
[0035] (6) A heating component given in (2) characterized by all the contents of a ceramic particle being 0.2 - 30 % of the weight in the metal layer by which said ceramic particle is distributed in said metal matrix, or (4).
[0036] (7) It is a heating component given in (1) which the synthetic-resin particle distributed in said metal matrix consists of a fluororesin, and is characterized by the particle size being 0.1-10 micrometers.
[0037] (8) It is a heating component given in (2) which the synthetic-resin particle distributed in said metal matrix consists of a fluororesin, and is characterized by the particle size being 0.1-10 micrometers.
[0038] (9) A heating component given in (1) characterized by all the contents of a synthetic-resin particle being two to 40 volume %s in the metal layer by which said synthetic-resin particle is distributed, or (7).
[0039] (10) A heating component given in (2) characterized by all the contents of a synthetic-resin particle being two to 50 volume %s in the metal layer by which said synthetic-resin particle is distributed, or (8).
[0040] (11) The metal matrix by which said particle is distributed is a heating component given in any of (1) to (10) characterized by being nickel or a nickel radical alloy they are.
[0041] (12) A heating component given in any of (1) to (11) characterized by having the layer which carries out electromagnetic-induction generation of heat according to an operation of an alternating magnetic field they are.

[0042] (13) A heating component given in any of (1) to (12) characterized by having a mold release layer on the front face by the side of a heated member they are.
[0043] (14) A heating component given in any of (1) to (13) characterized by being body of revolution they are.

[0044] (15) A heating component given in any of (1) to (13) characterized by being endless film-like body of revolution they are.
[0045] (16) Heating apparatus characterized by having a heating component given [as a heating component which heats a heated member] in any of (1) to (15) they are.
[0046] (17) Heating apparatus characterized by a heating component being a heating component given in any of (1) to (15) they are in the heating apparatus which has the heating component to which one field slides with supporter material, and the field of another side touches a heated member, and heats a heated member by this heating component.
[0047] (18) The heating component to which one field slides with supporter material, and the field of another side touches a heated member, In the heating apparatus which has the pressurization member which carries out a pressure welding to supporter material through this heating component, and forms nip, carries out pinching conveyance of the heated member between the heating component of said nip section, and a pressurization member, and heats a heated member by the heating component Heating apparatus characterized by a heating component being a heating component given in any of (1) to (15) they are.
[0048] (19) Said heating component is heating apparatus given in (18) characterized by following and driving to a pressurization member or a pressure-welding member by friction of the front face of the pressure-welding member and heating component which carry out a pressure welding to said pressurization member or a heating component peripheral face.
[0049] (20) Heating apparatus given in any of (16) to (19) which said heated member is a recorded material which supported the non-established toner image, and is characterized by carrying out heat fixing of the non-established toner image by the heat of a heating component at a recorded material they are.
[0050] (21) Heating apparatus given in any of (16) to (20) characterized by having a means to make an

alternating magnetic field act and to carry out electromagnetic-induction generation of heat of said heating component they are.
[0051] (22) Image formation equipment characterized by a heating fixing means being heating apparatus given in any of (16) to (21) they are in the image formation equipment which has an image formation means to form a non-established toner image in a recorded material, and a heating fixing means to make a recorded material carry out heat fixing of the non-established toner image.
[0052] (23) Said image formation equipment is image formation equipment given in (22) characterized by color picture formation being possible.
[0053] <** **> -- lubricity boils markedly the metal layer which made the metal matrix distribute either [at least] a ceramic particle or a synthetic-resin particle, and is superior to the metal layer which does not carry out distributed content of a ceramic particle or the synthetic-resin particle. Moreover, abrasion resistance also improves.
[0054] In the heating apparatus which has the heating component which has the metal layer in which one field slides on this invention with supporter material, and the field of another side heats a heated member in contact with a heated member, and this heating component By having prepared the metal layer which distributed either [at least] a ceramic particle or synthetic resin in the metal matrix in the supporter material of a heating component, and the field on which it slides, the sliding friction of a sliding surface with the supporter material of a heating component can be reduced, and the increment in the sliding friction by **** durability can be controlled further.
[0055] Therefore, since a slip of a heated member can be prevented, if conveyance of the stable heated member can be secured and it is in an image heating anchorage device, it becomes possible to offer conveyance of a high-definition image and the stable recorded material.
[0056] Furthermore, since a thing smaller than that of driving torque can be used as a drive motor of heating apparatus, it leads to reduction of product cost.
[0057]
[Embodiment of the Invention] The operation gestalt of this invention is explained below.
[0058] <The 1st example> (drawing 1 - drawing 9)
(1) Example drawing 1 of image formation equipment is the configuration schematic drawing of an example of image formation equipment. The image formation equipment of this example is the color laser beam printer of electrophotography process use.
[0059] 101 is the photoconductor drum made with the organic photo conductor and amorphous silicon photo conductor as image support, and a rotation drive is carried out at a predetermined process rate (peripheral velocity) at the counterclockwise rotation of ****.
[0060] A photoconductor drum 101 receives uniform electrification processing of a polarity and potential predetermined in the rotation process with the electrification equipments 102, such as an electrification roller.
[0061] Subsequently, the laser beam 103 outputted to the electrification processing side from the laser optical box (laser scanner) 110 receives scan exposure processing of image information. The laser optical box 110 outputs the laser beam 103 modulated corresponding to the time series electrical-and-electric-equipment digital pixel signal of the image information from picture signal generators, such as a non-illustrated image reader, (ON/OFF), carries out scan exposure and carries out the 101st page of a photoconductor drum. Thereby, the electrostatic latent image corresponding to image information is formed in a photoconductor drum side. 109 is a mirror which makes the exposure location of a photoconductor drum 101 deflect the output laser beam from the laser optical box 110.
[0062] In the case of full color image formation, the scan exposure and latent-image formation about the 1st target color-separation component image, for example, yellow component image, of a full color image are made, and the latent image is developed as a yellow toner image by actuation of yellow development counter 104Y of the 4 color color developers 104. The yellow toner image is imprinted by the 105th page of a middle imprint drum in the primary imprint section T1 which is the contact section (or contiguity section) of a photoconductor drum 101 and the middle imprint drum 105. The 101st page of the photoconductor drum after the toner image imprint to the 105th page of a middle imprint drum is cleaned by the cleaner 107 in response to removal of the adhesion residues, such as a transfer residual toner.
[0063] The above process cycles of electrification / scan exposure, development, a primary imprint, and cleaning the 2nd color-separation component image (for example, a Magenta component image --) of the target

full color image Magenta development counter 104M -- actuation and the 3rd color-separation component image (for example, a cyanogen component image --) cyanogen development counter 104C -- actuation and the 4th color-separation component image (for example, a black component image --) Sequential execution of the black development counter 104BK is carried out about each color-separation component image of actuation. The toner image of four colors of a yellow toner image, a Magenta toner image, a cyanogen toner image, and a black toner image is imprinted one by one in piles by the 105th page of a middle imprint drum, and the color toner image corresponding to the target full color image is formed.

[0064] It is what prepared the elastic layer of inside resistance, and the surface of high resistance in metal drum lifting, and a photoconductor drum 101 is contacted, or it approaches, the rotation drive of the **** is clockwise carried out with the same peripheral velocity as a photoconductor drum 101, and the middle imprint drum 105 gives bias potential to the metal drum of the middle imprint drum 105, and makes the toner image by the side of a photoconductor drum 101 imprint to the 105th page side of said middle imprint drum by the potential difference with a photoconductor drum 101.

[0065] The color toner image formed in the 105th page of the above-mentioned middle imprint drum is imprinted by the field of the recorded material P sent into said secondary imprint section T2 from the non-illustrated feed section to predetermined timing in the secondary imprint section T2 which is the contact nip section of said middle imprint drum 105 and imprint roller 106. The imprint roller 106 carries out the package imprint of the synthetic color toner image from the 105th page side of a middle imprint drum one by one to a recorded material P side by supplying a toner and the charge of reversed polarity from the tooth back of a recorded material P.

[0066] It dissociates from the 105th page of a middle imprint drum, and the recorded material P which passed the secondary imprint section T2 is introduced to an anchorage device (image heating apparatus) 100, and is discharged in response to heating fixing processing of a non-established toner image by the paper output tray which is not illustrated [outside the plane]. An anchorage device 100 is explained in full detail by the following (2) terms.

[0067] The middle imprint drum 105 after the color toner image imprint to a recorded material P is cleaned by the cleaner 108 in response to removal of the adhesion residues, such as a transfer residual toner and paper powder. This cleaner 108 is held in the non-contact condition at the middle imprint drum 105, and is always held in the contact condition at the middle imprint drum 105 in the secondary imprint activation process of a color toner image over a recorded material P from the middle imprint drum 105.

[0068] Moreover, the imprint roller 106 is also always held in the non-contact condition at the middle imprint drum 105, and it is held in the contact condition through a recorded material P at the middle imprint drum 105 in the secondary imprint activation process of a color toner image over a recorded material P from the middle imprint drum 105.

[0069] The image formation equipment of this example can also perform the printing mode of mono-color pictures, such as monochrome image. Moreover, a double-sided image printing mode can also be performed.

[0070] A double-sided image print is outputted by front flesh-side reversal being carried out through the recycling conveyance device in which it does not illustrate, and the recorded material [finishing / the image print of the 1st side] P to which it came out of the anchorage device 100 in the case of the double-sided image printing mode being again sent into the secondary imprint section T2, and receiving the toner image imprint to the 2nd page, and it being introduced into an anchorage device 100 and receiving the fixing processing of a toner image to the 2nd page again.

[0071] (2) The anchorage device 100 as heating apparatus in anchorage device 100 this example is equipment of an electromagnetic-induction heating method. The transverse-plane model Fig. of an important section and drawing 4 of the crossing side-face model Fig. of the important section of the anchorage device 100 of this example [drawing 2] and drawing 3 are the vertical section model Figs. of an important section.

[0072] The anchorage device 100 of this example is equipment of a pressurization roller drive method and an electromagnetic-induction heating method using the fixing film of the shape of a cylinder of electromagnetic-induction febrility as a heating component like the anchorage device of above-mentioned drawing 11 . The same sign is given to the equipment of drawing 11 , and common common configuration member and part, and explanation for the second time is omitted.

[0073] A magnetic field generating means consists of magnetic core 17a, 17b, 17c, and an exiting coil 18.

[0074] It is the member of high permeability, and magnetic core 17a, 17b, and 17c have the good ingredient

used for the core of transformers, such as a ferrite and a permalloy, and is good to use a ferrite with little [it is more desirable and] loss of at least 100kHz or more.
[0075] The excitation circuit 27 (drawing 5) is connected to the exiting coil 18 at electric supply section 18a and 18b. This excitation circuit 27 can generate now 20 to 500kHz high frequency in switching power supply.
[0076] An exiting coil 18 generates alternate magnetic flux according to the alternation current (high frequency current) supplied from the excitation circuit 27.
[0077] 16a and 16b are cross-section abbreviation half circular ** type film supporter material, oppose an opening side mutually, constitute an approximate circle prism, and make the outside have carried out outer fitting of the fixing film 10 of the shape of a cylinder which is a heating component loosely.
[0078] Said film supporter material 16a holds magnetic core 17a, 17b and 17c as a magnetic field generating means, and an exiting coil 18 inside. Moreover, the right heat-conduction member 40 which makes a space perpendicular direction straight side like drawing 4 at film supporter material 16a is arranged inside the fixing film 10 by the opposed face side with the pressurization roller 30 of the fixing nip section N.
[0079] This right pyroductivity member 40 is a member which supports the fixing film 10 from that inner skin to the welding pressure of the pressurization roller 30 in the fixing nip section N. Aluminum is used for the right thermal-conductivity member 40 in this example. Thermal conductivity k is k= 240 [W-m -1 and K-1], and said good heat-conduction member 40 is thickness 1 [mm]. Moreover, the right heat-conduction member 40 is arranged out of this magnetic field so that it may not be influenced of the exiting coil 18 which is a magnetic field generating means, and the magnetic field generated from magnetic core 17a, 17b, and17c. You specifically arrange the right heat-conduction member 40 in the location which separated magnetic core 17c to the exiting coil 18, you make it located in the outside of the magnetic path by the exiting coil 18, and he is trying not to affect the right heat-conduction member 40.
[0080] 22 is the oblong rigid stay for pressurization which the inside flat-surface section and the right heat-conduction member 40 of film supporter material 16b were made to contact, and was arranged.
[0081] 19 is an insulating member for insulating between the rigid stays 22 for pressurization with magnetic core 17a, 17b, 17c, and an exiting coil 18.
[0082] Flange material 23a and 23b are attached outside the right-and-left both ends of the assembly of film supporter material 16a and 16b, it is attached free [rotation], fixing said right-and-left location, and carries out the duty which regulates the approach migration which meets film supporter material 16 straight side of the fixing film 10 in response to the edge of said fixing film 10 at the time of rotation of the fixing film 10.
[0083] The pressurization roller 30 as a pressurization member is constituted from heat-resistant elastic material layer 30b which carried out shaping covering, such as a silicone rubber fluororubber fluororesin, by the shape of a roller at this cardiac one at rodding 30a and the circumference of said rodding, and rotation freedom is made to carry out bearing maintenance, and it is arranged in chassis side plate Kanema whose both ends of rodding 30a are not illustrated [of equipment] at it.
[0084] It depresses to the configuration stay 22 for pressurization by ****(ing) pressurization spring 25a and 25b, respectively between the both ends of the rigid stay 22 for pressurization, and spring receptacle member 29a and 29b by the side of an equipment chassis, and the force is made to act. The inferior surface of tongue of the good heat-conduction member 40 and the top face of the pressurization roller 30 carry out a pressure welding on both sides of the fixing film 10 by this, and the fixing nip section N of predetermined width of face is formed.
[0085] The rotation drive of the pressurization roller 30 is carried out by the driving means M (drawing 2) at the counterclockwise rotation of ****. By the rotation drive of this pressurization roller 30, turning effort acts on the fixing film 10 by the frictional force of said pressurization roller 30 and external surface of the fixing film 10, and while the inner skin of said fixing film 10 sticks and slides on the inferior surface of tongue of the right heat-conduction member 40 in the fixing nip section N, the periphery of film supporter material 16a and 16b is clockwise rotated mostly with the peripheral velocity corresponding to the peripheral velocity of the pressurization roller 30 of ****.
[0086] When the right heat-conduction member 40 has the effectiveness which makes the temperature distribution of a longitudinal direction homogeneity, for example, small size paper is ****(ed), the heating value of the non-paper-feed-section in the fixing film 10 carries out heat transfer to the right heat-conduction member 40, and heat transfer of the heating value of a non-paper-feed-section is carried out by heat conduction of the longitudinal direction in the right heat-conduction member 40 to small size ********. Thereby, the

effectiveness of reducing the power consumption at the time of small size ****** is also acquired.
[0087] Moreover, as shown in drawing 5 , keep predetermined spacing in the longitudinal direction, make the peripheral surface of film supporter material 16a carry out formation possession of the convex rib section 16c, it is made to reduce the contact sliding friction of the peripheral surface of film supporter material 16a, and the inside of the fixing film 10, and the rotation load of the fixing film 10 is lessened. Formation possession of such convex rib section 16c can be carried out also like film supporter material 16b.
[0088] Drawing 6 expresses the situation of generating of alternate magnetic flux typically. Magnetic flux C expresses a part of generated alternate magnetic flux. The alternate magnetic flux C led to magnetic core 17a, 17b, and 17c makes the electromagnetic-induction exoergic layer of the fixing film 10 generate an eddy current between magnetic core 17a and magnetic core 17b and between magnetic core 17a and magnetic core 17c. This eddy current makes an electromagnetic-induction exoergic layer generate the Joule's heat (eddy current loss) with the specific resistance of an electromagnetic-induction exoergic layer. the consistency of the magnetic flux by which the calorific value Q here passes along an electromagnetic-induction exoergic layer -- being decided -- the graph of drawing 6 -- distribution [like] is shown.
[0089] The graph of drawing 6 shows the location of the circumferencial direction in the fixing film 10 which expressed with the include angle theta to which the axis of ordinate set the core of magnetic core 17a to 0, and an axis of abscissa shows the calorific value Q in the electromagnetic-induction exoergic layer of the fixing film 10. Here, when the maximum calorific value is set to Q, calorific value defines the exoergic region H as the field more than Q/e. This is a field where calorific value required for fixing is obtained.
[0090] Temperature control of the temperature of this fixing nip section N is carried out so that temperature predetermined by the current supply source to an exiting coil 18 being controlled by the temperature control system including a temperature detection means by which it does not illustrate may be maintained.
[0091] 26 (drawing 2) is temperature sensors, such as a thermistor which detects the temperature of the fixing film 10, and he is trying to control the temperature of the fixing nip section N based on the temperature information on the fixing film 10 measured with the temperature sensor 26 in this example.
[0092] In the condition that **(ed), the fixing film 10 rotated, electromagnetic-induction generation of heat of the fixing film 10 was made as mentioned above by the electric supply to an exiting coil 18 from the excitation circuit 27, and temperature control of the fixing nip section N was started and carried out to predetermined temperature An image side between the fixing film 10 of the fixing nip section N, and the pressurization roller 30 Facing up, [the recorded material P with which the non-established toner image t conveyed from the image formation means section was formed] That is, it is introduced into a fixing film plane face to face, and in the fixing nip section N, an image side sticks to the external surface of the fixing film 10, and pinching conveyance is carried out in the fixing nip section N together with the fixing film 10. In the process in which pinching conveyance of the recorded material P is carried out together with the fixing film 10 in this fixing nip section N, it is heated by electromagnetic-induction generation of heat of the fixing film 10, and heating fixing of the non-established toner image t on a recorded material P is carried out. If the fixing nip section N is passed, it dissociates from the external surface of the fixing film 10, and discharge conveyance of the recorded material P is carried out. After passing the fixing nip section N, it cools and the heating fixing toner image t on a recorded material P turns into a permanent fixing image.
[0093] The width of face of the shortest of the fixing nip section N of the anchorage device 100 of full color image formation equipment is [7.0mm or more] desirable in order to fully secure fixable [of a full color image with much toner ******]. Since sufficient heating value for fixing cannot be given to the non-established toner t and a recorded material P as it is less than [this], poor fixing will occur. Moreover, in order to fully secure the permeability of the full color image of an OHP film, the planar pressure of the fixing nip section N is 0.8 kgf/cm2 further. The above is desirable. Since the toner layer t front face to which it was fixed that it is less than [this] cannot be made smooth enough, scattered reflection light will increase and the amount of transmitted lights of the image section on an OHP film will decrease.
[0094] The pressurization roller 30 and the fixing film 10 are made to pressurize by 21kgf(s) with the anchorage device 100 of this example from the above viewpoint, and it is the planar pressure of about 8.0mm and the fixing nip section N about the width of face of the fixing nip section N 1.2 kgf/cm2 It carried out (the die length of the longitudinal direction of the fixing nip section N is 220mm).
[0095] In this example, as shown in drawing 2 , in order to intercept the electric supply to the exiting coil 18 at the time of an overrun in the opposite location of the exoergic region H of the fixing film 10 (drawing 6), the

thermo switch 50 which is a temperature detector element is arranged.

[0096] Drawing 7 is the circuit diagram of the safety circuit used by this example. The thermo switch 50 which is a temperature detector element is connected with the DC power supply of 24V, and the relay switch 51 at the serial, if a thermo switch 50 is turned off, the electric supply to a relay switch 51 was intercepted, the relay switch 51 operated, and the configuration which intercepts the electric supply to an exiting coil 18 is taken by intercepting the electric supply to the excitation circuit 27. The thermo switch 50 set OFF operating temperature as 220 degrees C.

[0097] Moreover, the thermo switch 50 countered the exoergic region H of the fixing film 10, and was arranged in the external surface of the fixing film 10 non-contact. Distance between a thermo switch 50 and the fixing film 10 was set to about 2mm. Thereby, the blemish by contact of a thermo switch 50 is not attached to the fixing film 10, and degradation of the fixing image by durability can be prevented.

[0098] Even when an anchorage device stops where paper is caught in the fixing nip section N, electric supply is continued by the exiting coil 18 and the fixing film 10 continues generating heat [according to this example] at the time of the anchorage device overrun by equipment failure unlike the configuration which generates heat in the fixing nip section N like the equipment of above-mentioned drawing 11 , since it is not not exoergic, in the fixing nip section N in which paper has been caught, paper is not heated directly. Moreover, since the thermo switch 50 was arranged in the exoergic region H with much calorific value, when the thermo switch 50 has sensed 220 degrees C and the thermo switch was turned off, the electric supply to an exiting coil 18 is intercepted by the relay switch 51.

[0099] According to this example, the ignition temperature of paper can stop generation of heat of the fixing film 10, without paper igniting, since it is nearly about 400 degrees C.

[0100] The thermal fuse other than a thermo switch can also be used as a temperature detector element.

[0101] In this example, since the toner which made Toner t contain the low softening matter was used, the oil spreading device for offset prevention has not been prepared in an anchorage device 100, but when the toner which is not making the low softening matter contain is used, an oil spreading device may be established. Moreover, also when the toner which made the low softening matter contain is used, oil spreading and cooling separation may be performed.

[0102] A) As a lead wire (electric wire) which makes a coil (coil) constitute, using that (pencil) to which one bundled at a time two or more copper thin lines by which pre-insulation was carried out, respectively, the exiting coil 18 exiting coil 18 rolls this two or more times, and forms the exiting coil. In this example, 10 turn ****** exiting coil 18 is formed.

[0103] Pre-insulation is good to use covering which has thermal resistance in consideration of heat conduction by generation of heat of the fixing film 10. For example, it is good to use covering of amide imide, polyimide, etc.

[0104] An exiting coil 18 may apply a pressure from the exterior, and may raise tight ness.

[0105] He is trying for the configuration of an exiting coil 18 to meet the curved surface of an exoergic layer like drawing 2 . In this example, the distance between the exoergic layer of the fixing film 10 and an exiting coil 18 was set up so that it might be set to about 2mm.

[0106] As the quality of the material of the exiting coil attachment component 19, it excels in insulation, and what has good thermal resistance is good. For example, it is good to choose phenol resin, a fluororesin, polyimide resin, polyamide resin, polyamidoimide resin, PEEK resin, PES resin, PPS resin, PFA resin, PTFE resin, an FEP resin, LCP resin, etc.

[0107] Although it is [the absorption efficiency of magnetic flux] higher to bring the distance between the magnetic cores 17a, 17b, and 17c and an exiting coil 18, and the exoergic layer of the fixing film 10 close as much as possible, since this effectiveness will fall remarkably if this distance exceeds 5mm, it is good to make it less than 5mm. Moreover, if it is less than 5mm, the exoergic layer of the fixing film 10 and the distance of an exiting coil 18 do not need to be fixed.

[0108] Pre-insulation has been performed [leader line / (drawing 5) /, i.e., 18aand18b, / from the exiting coil attachment component 19 of an exiting coil 18] to the outside of a pencil about the outer part from the exiting coil attachment component 19.

[0109] B) Fixing film 10 drawing 8 is the lamination model Fig. of the fixing film 10 in this example.

[0110] The fixing film 10 of this example is characterized by having formed the lubricative exoergic layer 5 which consists of metals with which the ceramic particle was distributed by film inner skin. It is the fixing film

10 of the composite construction which carried out the laminating of the mold release layer 1 to the peripheral face of this lubricative exoergic layer 5 further with the elastic layer 2 at that peripheral face.
[0111] While this lubricative exoergic layer 5 functions as an electromagnetic-induction exoergic layer, the lubricity of the inner skin of the fixing film 10 of the shape of a cylinder as a heating component is raised.
[0112] A primer layer (un-illustrating) may be prepared between each class for adhesion between the lubricative exoergic layer 5 and the elastic layer 2, and adhesion between the elastic layer 2 and the mold release layer 1.
[0113] In the fixing film 10 which is a cylindrical shape-like, the lubricative exoergic layer 5 is a film guide contact surface side, and the mold release layer 1 is a pressurization roller contact surface side. As mentioned above, in alternate magnetic flux acting on the lubricative exoergic layer 5 which serves also as the role of an exoergic layer, an eddy current occurs in the lubricative exoergic layer 5, and said lubricative exoergic layer 5 generates heat. The recorded material P with which the heat which carried out induction generation of heat in this layer heats the fixing film 10 whole through elastic layer 2 and the mold release layer 1, and is ****(ed) by the fixing nip section N is heated, and heating fixing of a toner t image is made.
[0114] a. Nickel, iron, ferromagnetism SUS, a ferromagnetic metal called a nickel-cobalt alloy, or non-magnetic metal called aluminum is sufficient as the matrix metal which forms the lubricative exoergic layer 5 lubricity exoergic layer 5.
[0115] Moreover, paying attention to the improvement in endurance of the inner skin of the fixing film 10, the wear-resistant high alloy of nickel-Lynn, nickel-Lynn-boron, etc. is sufficient.
[0116] Moreover, when nickel is used for a matrix metal, in order to prevent the metal fatigue by the crookedness stress of the repeat received at the time of rotation of the fixing film 10, it is also good in nickel to add manganese.
[0117] Since the lubricative exoergic layer 5 has the operation as a lubricating layer and an exoergic layer, its ferromagnetic metal which carries out electromagnetic-induction generation of heat more efficient than non-magnetic metal is [a matrix metal] desirable. Nickel with comparatively easy production by electrolysis plating or nonelectrolytic plating or a nickel radical alloy is desirable more preferably.
[0118] In these metal matrices, the lubricative exoergic layer 5 is distributing a ceramic particle, and has not only electromagnetic-induction generation of heat but the operation on the lubrication disposition of the inner skin of the fixing film 10.
[0119] Therefore, as for this ceramic particle, what has low coefficient of friction is good, and its high ceramics of self-lubricity is desirable. As high ceramics of self-lubricity, the boron nitride, graphite, and molybdenum disulfide with which a crystal structure makes the layer structure by the hexagonal lattice are good. Among these, when creating the lubricative exoergic layer 5 with electrolysis plating, the boron nitride which is what it is easy to distribute in electrocasting is more desirable.
[0120] Moreover, the abrasion resistance of the lubricative exoergic layer 5 can also be raised by distributing a ceramic particle. Therefore, since it is based on the sliding friction of fixing film inner skin, and metaled wear, it can delete and powder can be reduced, the sliding friction of the fixing film 10, and the right heat-conduction member 40 and film supporter material 16 can be reduced over a long period of time.
[0121] The particle size of these ceramic particles has desirable 0.1-10 micrometers. Sufficient lubricity cannot be obtained even if too little, even when it is more excessive than this. Moreover, when the thickness of the lubricative exoergic layer 5 by which these particles are distributed is thinner than 10 micrometers, as for the maximum grain size of a particle, it is desirable not to exceed this thickness. When particle size is larger than thickness, the irregularity of a particle occurs on a front face and there is a possibility that the fixing film 10 may deform with the pressure welding in the fixing nip section N.
[0122] Although the content of a ceramic particle can be set up suitably if needed, 0.2 - 20 % of the weight is desirable. The effectiveness of the lubricity and the wear-resistant improvement by the ceramic particle distributed as it is 0.2 or less % of the weight is seldom accepted. Moreover, if the content of a ceramic particle exceeds 20 % of the weight, since the composite-coatings coat obtained will become weak, exoergic effectiveness will fall not only flexibility falls, but and fixing capacity will decline, it is not desirable.
[0123] The thickness of the lubricative exoergic layer 5 is thicker than the skin depth expressed with the following formula, and it is desirable to make it 200 micrometers or less. Skin depth sigma [m] is expressed in frequency [of an excitation circuit] f [Hz], permeability mu, and specific resistance rho [omegam] as sigma=503x(rho/fmu) 1/2.
[0124] This shows the depth of absorption of the electromagnetic wave used by electromagnetic induction, and

it is shown in a place deeper than this that the reinforcement of an electromagnetic wave has become below 1/e. Conversely, if it says, almost all energy is absorbed even in this depth (drawing 9 R> 9).
[0125] The thickness of the lubricative exoergic layer 5 has 1 micrometers or more preferably good 100 micrometers or less. If the thickness of the lubricative exoergic layer 5 is thinner than 1 micrometer, since almost all electromagnetic energy cannot be absorbed, effectiveness will worsen. Moreover, for rigidity becoming high too much, if the lubricative exoergic layer 5 exceeds 100 micrometers, and flexibility worsening, and using it as body of revolution, it is not realistic.
[0126] The lubricative exoergic layer 5 (boron nitride particle distribution nickel) which is the description of this invention is compound electrocasting obtained by the electrolysis galvanizing method. The lubricative exoergic layer 5 was produced on conditions which are described below. First, nickel amiosulfonate, SHUU-ized nickel, boric acid, and the water solution that blended the boron nitride particle were prepared, after performing electrorefining, carrying out circulation dipping of between the containers and cells which were filled up with activated carbon, the stress reducer and the pit prevention agent were added and the electrolytic bath was adjusted. The electrocrystallization object with a thickness of about 60 micrometers which distributed the boron nitride particle was formed by making the basket made from titanium into which cathode and a nickel pellet were put for the cylindrical matrix made from the rotating stainless steel into an anode plate, having added the proper brightener to these electrolytic baths, having maintained bath temperature and a pH value at the predetermined value, and continuing stirring. The content of the boron nitride particle in the obtained lubricative exoergic layer 5 was 5.5 % of the weight.
[0127] The lubricative exoergic layer 5 of the above configuration raises the lubricity of fixing film 10 inner skin, and bears the role which reduces the sliding friction of the fixing film 10, and the right heat-conduction member 40 and film supporter material 16. Therefore, the driving torque of an anchorage device 100 can be reduced.
[0128] b. The elastic layer 2 elastic layers 2 are silicone rubber, a fluororubber, fluoro silicone rubber, etc., and the quality of the material with sufficient thermal resistance and sufficient thermal conductivity is used.
[0129] The thickness of the elastic layer 2 has desirable 10-500 micrometers. This elastic layer 2 is thickness required in order to guarantee fixing image quality.
[0130] When printing a color picture, in a photograph, a solid image is formed over an especially big area on a recorded material P. In this case, if a heating surface (mold release layer 1) cannot be followed at the irregularity of a recorded material P, or the irregularity of the toner layer t, heating nonuniformity will occur and gloss nonuniformity will occur in an image in a part with many amounts of heat transfer, and few parts. The part with many amounts of heat transfer has high glossiness, and its glossiness is low in a part with few amounts of heat transfer. As thickness of the elastic layer 2, in 10 micrometers or less, the irregularity of a recorded material or a toner layer will not be able to be followed, and image gloss nonuniformity will occur. Moreover, when the elastic layer 2 is 1000 micrometers or more, it becomes difficult for the thermal resistance of an elastic layer to become large and to realize the quick start. The thickness of the elastic layer 2 has more preferably good 50-500 micrometers.
[0131] If the elastic layer 2 has a too high degree of hardness, it will not be able to follow the irregularity of a recorded material P or the toner layer t, and image gloss nonuniformity will generate it. Then, as a degree of hardness of the elastic layer 2, 45 degrees or less are more preferably good below 60 degrees (JIS-A:JIS-K A mold testing machine). About the thermal conductivity lambda of the elastic layer 2, 6x10-4 to 2x10-3 [cal/cm-sec and deg] is good. Thermal conductivity lambda of thermal resistance is large when smaller than 6x10-4 [cal/cm-sec and deg], and the temperature rise in the surface (mold release layer 1) of the fixing film 10 becomes late. In being larger than 2x10-3 [cal/cm-sec and deg], a degree of hardness becomes [thermal conductivity lambda] high too much, or a compression set gets worse. Therefore, as for thermal conductivity lambda, 6x10-4 to 2x10-3 [cal/cm-sec and deg] is good. 8x10-4 to 1.5x10-3 [cal/cm-sec and deg] is more preferably good.
[0132] c. The mold release layer 1 mold-release layer 1 can choose the good ingredient of mold-releases characteristic, such as a fluororesin, silicone resin, fluoro silicone rubber, a fluororubber, silicone rubber, and PFA, PTFE, FEP, and thermal resistance.
[0133] The thickness of the mold release layer 1 has desirable 1-100 micrometers. The problem that the bad part of a mold-release characteristic will be made in the ** nonuniformity of a paint film if the thickness of the mold release layer 1 is smaller than 1 micrometer, or endurance runs short occurs. Moreover, if a mold release layer

exceeds 100 micrometers, the problem that heat conduction gets worse will occur, especially when it is the mold release layer of a resin system, a degree of hardness will become high too much, and the effectiveness of the elastic layer 2 will be lost.

[0134] C) Effect The configuration of the fixing film 10 of ********** consists of 60 micrometers of composite coatings which distributed the boron nitride particle with a mean particle diameter of about 1 micrometer 5.5% of the weight in nickel as silicone rubber 300micrometer and a lubricative exoergic layer 5 as PFA30micrometer and an elastic layer 2 as a mold release layer 1.

[0135] The boron nitride of the particle which the lubricative exoergic layer 5 was made to distribute by this example has the hexagonal crystal structure, and shows the outstanding lubricity to which even an ambient atmosphere 1000 degrees C or more maintains about 0.2 coefficient of friction with a boron nitride simple substance.

[0136] The configuration of the fixing film 10 used as an example of a comparison is the thing of the lamination of drawing 12 of the conventional example mentioned above. That is, the mold release layer which 1 becomes from PFA, the elastic layer which 2 becomes from silicone rubber, and 3 are exoergic layers which consist of nickel. In the configuration of the fixing film 10 of the example of a comparison, a different point from the fixing film 10 in this example is having formed not a lubricative exoergic layer 5 like this example but the exoergic layer 3 which consists of nickel which only carries out electromagnetic-induction generation of heat, and is the same about the other mold release layer 1 and the elastic layer 2. [of the quality of the material and thickness] The thickness of the exoergic layer 3 of the fixing film 10 of the example of a comparison was set as 60 micrometers so that it might become equivalent to the thickness (60 micrometers) of the lubricative exoergic layer 5 of the fixing film 10 of this example. Thereby, the thickness of class 1-2-3 is equivalent at the example of a comparison, and this example, and becomes equivalent [the thickness of the fixing film 10 whole].

[0137] The effectiveness of this example was checked by evaluating the driving torque and the jam incidence rate of an anchorage device 100.

[0138] First, each anchorage device 100 equipped with the fixing film 10 of this example and the example of a comparison was built into full color image formation equipment, and **** durability was performed.

[0139] With the fixing film 10 of the example of a comparison, when it remained as it is, the sliding friction was high, and since stable paper conveyance was unrealizable, about 1g of high temperature greases was applied to the film guide contact surface side as lubricant. a **** rate -- for 1 minute -- A4 size paper -- a 16-sheet copy -- the speed by which paper is carried out -- it is -- a connoisseur -- Kaminaka's temperature control was set as 190 degrees C which is the temperature which can be established.

[0140] and A4 size paper -- a 100,000-sheet copy -- the driving torque of the anchorage device 100 before and after carrying out paper, and change of a slip incidence rate were investigated.

[0141] About driving torque, on the pressurization roller 30 whose fixing film 10 is a drive means of communication, since it was the configuration which carries out follower rotation, driving torque measured the output torque of the pressurization roller 30. the evaluation approach -- a fixing temperature control condition -- the output torque at the time of empty rotation -- a 100,000-sheet copy -- we decided to measure and compare in front of paper and in the back.

[0142] About the slip, the incidence rate of the slip generated between a recorded material P and the pressurization roller 30 was investigated. A recorded material P can detect whether paper was delivered from the anchorage device 100 in predetermined time, and, as for the delivery sensor (non-** Fig.) by which generating of this slip was prepared in the anchorage device 100, can know the count of generating of a slip by acting as the monitor of that detection signal. the evaluation approach -- 100,000 -- it set on sheet copy paper, and the slip incidence rate for 95000-100000 pages was investigated and compared in the end for initial 0-5000 pages.

[0143] These results are shown in the part of the example 1 of Table 1, and the example of a comparison.

[0144] As shown in Table 1, with the fixing film 10 of the example of a comparison, driving torque carried out the increment in 2.3 kgf-cm before and behind the **** durability of 100,000 sheets. This is because degradation of the grease by the oil component of grease having volatilized and the nickel layer generated by sliding could be deleted and the lubricity of grease was lost with powder.

[0145] Moreover, although a slip was not generated the early stages of durability, the slip incidence rate increased by the increment in driving torque in the end of durability.

[0146] On the other hand, in this example, driving torque almost equivalent to the example of a comparison is

realizable without spreading of lubricant in the early stages of durability.
[0147] furthermore, a 100,000-sheet copy -- it turns out that driving torque is suppressed after paper by the increment in +0.3 kgf-cm, and the driving torque in early stages of **** is maintained mostly. A slip was not generated in the early stages of durability, and the final stage, either.
[0148] Thus, conveyance of the recorded material stabilized from beginning to end is realizable with the fixing film 10 of this example.
[0149]
[Table 1]
表 1

	実施例1	実施例2	比較例
定着フィルム内周面	BN粒子＋ニッケル	PTFE粒子＋ニッケル	ニッケル（＋グリース）
駆動トルク (kgf・cm)			
耐久前	3.0	2.8	2.6
耐久後	3.3 <+0.3>	3.0 <+0.2>	4.9 <+2.3>
スリップ発生率			
耐久初期	0	0	0
耐久終盤	0	0	131/5000

BN:窒化ホウ素　　< >内は、耐久後－耐久前の軸トルクの差を表す

[0150] The <2nd example> The 2nd example is explained below. Except for the configuration of the fixing film 10 described below, since the configuration of an anchorage device and image formation equipment is the same as that of an example 1, the explanation about these is omitted. Below, the fixing film of this example is explained.
[0151] 1) The fixing film 10 of fixing film 10 this example as well as the fixing film 10 of drawing 8 of an example 1 formed the lubricative exoergic layer 5 which is a layer which distributed the particle into the metal matrix at the inner skin of the fixing film 10. A different point from an example 1 is having used as synthetic resin the particle distributed in the metal matrix of the lubricative exoergic layer 5.
[0152] The lubricity of the lubricative exoergic layer 5 can be further raised by using a fluororesin with coefficient of friction smaller than the ceramics with the self-lubricity used for this synthetic resin in the example 1.
[0153] Moreover, the degree of hardness of the inner skin of the lubricative exoergic layer 5 can be made lower than the case where the ceramics of an example 1 is distributed.
[0154] Since the hardness difference can be made smaller when the degree of hardness of the inner skin of the fixing film 10 and the quality of the material of the right conductor 40 and the film supporter material 16 which slides is lower than the lubricative exoergic layer 5, wear of right heat-conduction member 40 and the film supporter material 16 can be reduced. As a result, it leads to reduction of a sliding friction.
[0155] 2) Except for the lubricative exoergic layer 5 lubricity exoergic layer 5, since the mold release layer 1 and the elastic layer 2 are the same as that of an example 1, omit the explanation about these.
[0156] Nickel, iron, ferromagnetism SUS, a ferromagnetic metal called a nickel-cobalt alloy, or non-magnetic metal called aluminum is sufficient as the matrix metal which forms the lubricative exoergic layer 5 like an example 1. Moreover, paying attention to the improvement in endurance of the inner skin of the fixing film 10, the wear-resistant high alloy of nickel-Lynn, nickel-Lynn-boron, etc. is sufficient. Moreover, when nickel is used for a matrix metal, in order to prevent the metal fatigue by the crookedness stress of the repeat received at the time of rotation of the fixing film 10, it is also good in nickel to add manganese.
[0157] Since the lubricative exoergic layer 5 has the operation as a lubricating layer and an exoergic layer, its ferromagnetic metal which carries out electromagnetic-induction generation of heat more efficient than non-magnetic metal is [a matrix metal] desirable. Nickel with comparatively easy production by electrolysis plating or nonelectrolytic plating or a nickel radical alloy is desirable more preferably.
[0158] The lubricative exoergic layer 5 of this example distributes a fluororesin particle in an above-mentioned matrix metal.
[0159] As this fluororesin, PFA, FEP, PTFE, ETFE, PCTFE, ECTFE, PVDF, PVF, etc. are mentioned, for

example.
[0160] The particle size of these fluororesin particles has desirable 0.1-10 micrometers. Sufficient lubricity cannot be obtained even if too little, even when it is more excessive than this. Moreover, when the thickness of the lubricative exoergic layer 5 by which these particles are distributed is thinner than 10 micrometers, as for the maximum grain size of a particle, it is desirable not to exceed this thickness. When particle size is larger than thickness, the irregularity of a particle occurs on a front face and there is a possibility that the fixing film 10 may deform with the pressure welding in the fixing nip section N.
[0161] Although the content of a fluororesin particle can be set up suitably if needed, 2 - 40 volume % is desirable. The effectiveness on the lubrication disposition by the particle distributed as it is below 2 volume % is seldom accepted. Moreover, if the content of a particle exceeds 40 volume %, not only flexibility falls, but the composite-coatings coat obtained will become weak and exoergic effectiveness will become inadequate.
[0162] 3) Effect The configuration of the fixing film 10 of ********** consists of 60 micrometers of composite coatings which did 27 volume % distribution of a PTFE particle with a mean particle diameter of about 1 micrometer into nickel as silicone rubber 300micrometer and a lubricative exoergic layer 5 as PFA30micrometer and an elastic layer 2 as a mold release layer 1.
[0163] Compared with other synthetic resin, since coefficient of friction is very small, a fluororesin is rich in lubricity. By forming the lubricative exoergic layer 5 which distributed this in the metal matrix, the lubricity of the inner skin of the fixing film 10 is raised.
[0164] Also with the fixing film 10 of this example, the same evaluation as an example 1 was performed.
[0165] Like a comparison in the example 1, the example of a comparison is the fixing film 10 of a configuration of that inner skin has the exoergic layer 3 of nickel, as shown in drawing 12 R> 2. With the fixing film 10 of the example of a comparison, when it remains as it is, a sliding friction is high, and since stable paper conveyance was unrealizable, about 1g of high temperature greases has been applied to a film guide contact surface side as lubricant.
[0166] the effectiveness of this example -- an example 1 -- the same -- A4 size paper 100,000 -- it checked by evaluating sheet copy paper durable the driving torque and the slip incidence rate of an anchorage device. a **** rate and a connoisseur -- Kaminaka's temperature control temperature, and driving torque and the measuring method of a slip incidence rate are the same as that of an example 1.
[0167] This result is shown in the part of the example 2 of Table 1.
[0168] In this example, driving torque almost equivalent to the example of a comparison can be realized in the early stages of durability, without applying lubricant.
[0169] furthermore, a 100,000-sheet copy -- the increment in driving torque is slight compared with +0.2 kgf-cm and +2.3 kgf-cm of the example of a comparison after paper, and it turns out that the driving torque in early stages of **** is maintained mostly.
[0170] Moreover, at this example, although a slip was not generated in the early stages of durability, and the final stage, either, in the example of a comparison, the slip was generated according to 131/5000 of probabilities in the end of durability.
[0171] Thus, conveyance of the recorded material stabilized from beginning to end with the fixing film 10 of this example is realizable.
[0172] <The 3rd example> (drawing 10)
Next, the 3rd example is explained. Except for the fixing film 10 described below, since the configuration of an anchorage device and image formation equipment is the same as that of an example 1, the explanation about these is omitted. The configuration of the fixing film 10 of this example is explained below.
[0173] 1) Fixing film 10 drawing 10 is the cross-section schematic diagram showing the configuration of the fixing film 10 of this example.
[0174] The fixing film 10 of this example is characterized by carrying out the laminating of the metal layer 4 which made fixing film inner skin distribute a ceramic particle in a single metal or an alloy matrix, and the metal layer 3 which becomes the peripheral face from a single metal or an alloy.
[0175] Here, since it mainly has the lubrication action of fixing film 10 inner skin for the former metal layer 4, since it has an electromagnetic-induction exothermic effect, a lubricating layer and the latter metal layer 3 are called an exoergic layer.
[0176] Moreover, since the lubricating layer 4 also uses the metal for the matrix of a particulate material, it has some exothermic effects.

[0177] Since the fixing film 10 of this example has separated the exothermic effect section and the lubrication action section, it cannot receive inhibition of the electromagnetic-induction exothermic effect by the particulate material easily. therefore, the upper limit of the content of the particle distributed by the lubricating layer 4 -- an example 1 -- said -- it can be made [more] than the lubricative exoergic layer 5 stated by 2. Therefore, the lubricity of the inner skin of the fixing film 10 can be raised more, without sacrificing exoergic effectiveness.
[0178] 2) Since the quality of the material and thickness of the exoergic layer 3 mold-release layer 1 and the elastic layer 2 are the same as that of an example 1, omit the explanation about these.
[0179] The exoergic layer 3 is good to use the metal of ferromagnetics, such as nickel, iron, ferromagnetism SUS, and a nickel-cobalt alloy. Although a nonmagnetic metal is sufficient, metals, such as more desirable good nickel of absorption of magnetic flux, iron, magnetic stainless steel, and a cobalt-nickel alloy, are good. Moreover, in order to prevent the metal fatigue by the crookedness stress of the repeat received at the time of fixing film 10 rotation, it is also good in nickel to add manganese.
[0180] As for the thickness, it is desirable to make it 200 micrometers or less more thickly than the skin depth expressed with the following formula. Skin depth sigma [m] is expressed in frequency [of an excitation circuit] f [Hz], permeability mu, and specific resistance rho [omegam] as sigma=503x(rho/fmu) 1/2.
[0181] This shows the depth of absorption of the electromagnetic wave used by electromagnetic induction, and it is shown in a place deeper than this that the reinforcement of an electromagnetic wave has become below 1/e. Conversely, if it says, almost all energy is absorbed even in this depth (drawing 9 R> 9).
[0182] The thickness of the exoergic layer 3 has preferably good 1 micrometers or more. If the thickness of the exoergic layer 3 is thinner than 1 micrometer, since almost all electromagnetic energy cannot be absorbed, effectiveness will worsen. Moreover, it is good to set up the thickness of the exoergic layer 3 so that the sum of the exoergic layer 3 and a lubricating layer 4 may be set to 100 micrometers or less. For rigidity becoming high too much, if the sum of the exoergic layer 3 and a lubricating layer 4 exceeds 100 micrometers, and flexibility worsening, and using it as body of revolution, it is not realistic.
[0183] 3) The matrix which constitutes lubricating layer 4 lubricating layer 4 may be a metal, and ferromagnetic metals, such as nickel, iron, ferromagnetism SUS, and a nickel-cobalt alloy, or non-magnetic metal called aluminum is sufficient as it. Moreover, paying attention to the improvement in endurance of the fixing film 10, the wear-resistant high alloy of nickel-Lynn, nickel-Lynn-boron, etc. is sufficient. Moreover, in order to prevent the metal fatigue by the crookedness stress of the repeat received at the time of fixing film 10 rotation, it is also good in nickel to add manganese. The endurance of the fixing film 10 improves by using such a metal.
[0184] Although the operation as an exoergic layer can also be added to a lubricating layer 4 since a metal is used for a matrix, electromagnetic-induction generation of heat can be carried out having used the ferromagnetic metal more efficient [direction] than non-magnetic metal.
[0185] Therefore, the nickel with production a ferromagnetic metal is at best still more desirable, and comparatively easy by electrolysis plating or nonelectrolytic plating for the matrix metal of a lubricating layer 4 or a desirable nickel radical alloy is good.
[0186] A lubricating layer 4 distributes a ceramic particle in these metal matrices, and aims at the lubrication disposition top of film inner skin.
[0187] As for this ceramic particle, what has low coefficient of friction is good, and its high ceramics of self-lubricity is good. As high ceramics of self-lubricity, the boron nitride, graphite, and molybdenum disulfide with which a crystal structure makes the layer structure by the hexagonal lattice are good. Among these, when creating a lubricating layer 4 with electrolysis plating, the boron nitride which is what it is easy to distribute in electrocasting is more desirable.
[0188] Moreover, the abrasion resistance of a lubricating layer 4 can also be raised by distributing a ceramic particle.
[0189] Therefore, the particle size of these ceramic particles that can reduce the sliding friction of the fixing film 10, and the right heat-conduction member 40 and film supporter material 16 over a long period of time since it can delete and powder can be reduced by the sliding friction of the inner skin of the fixing film 10 and metaled wear has desirable 0.1-10 micrometers. Sufficient lubricity cannot be obtained even if too little, even when it is more excessive than this. Moreover, when the thickness of the lubricating layer 4 by which these particles are distributed is thinner than 10 micrometers, as for the maximum grain size of a particle, it is desirable not to exceed this thickness. When particle size is larger than thickness, the irregularity of a particle occurs on a front face and there is a possibility that the fixing film 10 may deform with the pressure welding in

the fixing nip section N.
[0190] Although the content of a ceramic particle can be set up suitably if needed, 0.2 - 30 % of the weight is desirable. The effectiveness of the lubricity and the wear-resistant improvement by the ceramic particle distributed as it is 0.2 or less % of the weight is seldom accepted. Moreover, if the content of a ceramic particle exceeds 30 % of the weight, since the composite-coatings coat obtained will become weak and flexibility will fall, it is not desirable.
[0191] Since the fixing film 10 of this example has separated the exothermic effect section and the lubrication action section, its inhibition of the electromagnetic-induction exothermic effect by the distributed ceramic particle is smaller than the case of the lubricative exoergic layer 5 stated in the example 1.
[0192] Therefore, more upper limits of the ceramic particle content of the lubricating layer 4 of this example than the value (20 % of the weight) in the lubricative exoergic layer 5 stated in the example 1 can be set up.
[0193] The lubricating layer 4 described above is compound electrocasting obtained by the electrolysis galvanizing method. It produced according to the same plating conditions as an example 1.
[0194] 4) Effect The fixing film 10 of ********** is a configuration which consists of 15 micrometers of composite coatings which it distributes to nickel 45micrometer as silicone rubber 300micrometer and an exoergic layer 3, and distributed the boron nitride particle with a mean particle diameter of 1 micrometer in nickel as a lubricating layer 4 as PFA30micrometer and an elastic layer 2 as a mold release layer 1.
[0195] The lubricating layer 4 which is the inner skin of the fixing film 10 of this example is the same configuration as the lubricative exoergic layer 5 of the inner skin of the fixing film 10 of an example 1. This lubricating layer 4 can raise the lubricity of the inner skin of the fixing film 10, can reduce the sliding friction at the time of rotation of the fixing film 10, and can reduce the driving torque of an anchorage device.
[0196] Therefore, also in the fixing film 10 of this example, conveyance of the recorded material stabilized from beginning to end is realizable like an example 1.
[0197] The <4th example> The 4th example is explained below. Except for the fixing film 10 described below, since the configuration of an anchorage device and image formation equipment is the same as that of an example 1, the explanation about these is omitted. Below, the fixing film 10 of this example is explained.
[0198] 1) The fixing film 10 of fixing film 10 this example as well as an example 3 forms the lubricating layer 4 which has a lubrication action in the inner skin of the fixing film 10, and is characterized by carrying out the laminating of the exoergic layer 3 to the peripheral face.
[0199] A different point from an example 3 is having used as synthetic resin the particle which a lubricating layer's 4 is made to distribute.
[0200] The lubricity of a lubricating layer 4 can be further raised by using a fluororesin with coefficient of friction smaller than the ceramics with the self-lubricity used for this synthetic resin in the example 3.
[0201] Moreover, the degree of hardness of the inner skin of a lubricating layer 4 can be made lower than the case where the ceramic particle of an example 3 is distributed. For example, since the hardness difference can be made smaller when the degree of hardness of the inner skin of the fixing film 10 and the quality of the material of the right heat-conduction member 40 and the film supporter material 16 which slides is lower than a lubricating layer 4, wear of right heat-conduction member 40 and the film supporter material 16 can be reduced. As a result, it leads to reduction of a sliding friction.
[0202] 2) Except for lubricating layer 4 lubricating layer 4, since it is the same as that of an example 3 about the mold release layer 1, the elastic layer 2, and the exoergic layer 3, omit the explanation about these.
[0203] Compared with other synthetic resin, since coefficient of friction is very small, a fluororesin is rich in lubricity. By forming the lubricating layer 4 which distributed this in the metal matrix, the lubricity of the inner skin of the fixing film 10 is raised.
[0204] As a matrix metal which constitutes a lubricating layer 4, nickel, iron, ferromagnetism SUS, a ferromagnetic metal called a nickel-cobalt alloy, or non-magnetic metal called aluminum is sufficient like an example 3. Moreover, paying attention to the improvement in endurance of the fixing film 10, the wear-resistant high alloy of nickel-Lynn, nickel-Lynn-boron, etc. is sufficient. Moreover, in order to prevent the metal fatigue by the crookedness stress of the repeat received at the time of fixing film 10 rotation, it is also good in nickel to add manganese. The endurance of the fixing film 10 improves by using such a metal.
[0205] Although the operation as an exoergic layer can also be added to a lubricating layer 4 since a metal is used for a matrix, electromagnetic-induction generation of heat can be carried out having used the ferromagnetic metal more efficient [direction] than non-magnetic metal.

[0206] Therefore, the nickel with production a ferromagnetic metal is at best still more desirable, and comparatively easy by electrolysis plating or nonelectrolytic plating for the matrix metal of a lubricating layer 4 or a desirable nickel radical alloy is good.
[0207] The lubricating layer 4 of this example distributes a fluororesin in an above-mentioned matrix metal.
[0208] As this fluororesin, PFA, FEP, PTFE, ETFE, PCTFE, ECTFE, PVDF, PVF, etc. are mentioned, for example.
[0209] The particle size of these fluororesin particles has desirable 0.1-10 micrometers. Sufficient lubricity cannot be obtained even if too little, even when it is more excessive than this. Moreover, when the thickness of the lubricating layer 4 by which the thickness of the lubricating layer 4 by which these particles are distributed is distributed is thinner than 10 micrometers, as for the maximum grain size of a particle, it is desirable not to exceed this thickness. When particle size is larger than thickness, the irregularity of a particle occurs on a front face and there is a possibility that the fixing film 10 may deform with the pressure welding in the fixing nip section N.
[0210] Although the content of a fluororesin particle can be set up suitably if needed, 2 - 50 volume % is desirable. The effectiveness on the lubrication disposition by the particle distributed as it is below 2 volume % is seldom accepted. Moreover, if the content of a particle exceeds 50 volume %, since the composite-coatings coat obtained will become weak and flexibility will fall, it is not desirable.
[0211] Since the fixing film 10 of this example has separated the exothermic effect section and the lubrication action section, its inhibition of the electromagnetic-induction exothermic effect by the distributed fluororesin particle is smaller than the case of the lubricative exoergic layer 5 stated in the example 1.
[0212] Therefore, more upper limits of the fluororesin particle content of the lubricating layer 4 of this example than the value (40 volume %) in the lubricative exoergic layer 5 stated in the example 1 can be set up.
[0213] 3) Effect The fixing film 10 of ********** was considered as the configuration which consists of 15 micrometers of composite coatings which it distributes to nickel 45micrometer as silicone rubber 300micrometer and an exoergic layer 3, and distributed the PTFE particle with a mean particle diameter of 1 micrometer in nickel as a lubricating layer 4 as PFA30micrometer and an elastic layer 2 as a mold release layer 1.
[0214] The lubricating layer 4 which is the inner skin of the fixing film 10 of this example is the same configuration as the lubricative exoergic layer 5 of fixing film 10 inner skin of an example 2. This lubricating layer 4 can raise the lubricity of the inner skin of the fixing film 10, can reduce the sliding friction at the time of rotation of the fixing film 10, and can reduce the driving torque of an anchorage device.
[0215] Therefore, also in the fixing film 10 of this example, conveyance of the recorded material stabilized from beginning to end is realizable like an example 1.
[0216] <Others> In a metal matrix, 1 lubricity exoergic layer 5 or a lubricating layer 4 can distribute the mixture of both ceramic particle and synthetic-resin particle, and can also be constituted.
[0217] 2) In order to make the mutual sliding frictional force of the inferior surface of tongue of the right heat-conduction member 40 and the inner skin of the fixing film 10 in the fixing nip section N reduction-ize, lubricant, such as heat-resistant grease, can be made to be able to intervene between the inferior surface of tongue of the right heat-conduction member 40 of the fixing nip section N, and the inner skin of the fixing film 10, or the inferior surface of tongue of the right thermal-conductivity member 40 can also be covered with a lubrication member. Or surface slipping nature was not good in quality of the material like [at the time of using aluminum as a right heat-conduction member 40] as for this, when finish-machining is simplified, it prevents giving a blemish to the fixing film 10 which slides, and the endurance of the fixing film 10 getting worse.
[0218] In all the examples described above, driving torque reduction and reinforcement can be further attained by the above-mentioned lubricant spreading or the lubrication member.
[0219] 3) Moreover, the anchorage device in each example can also be made the configuration which **** set-up is carried out [configuration] among two or more members, and rotates the fixing film of the shape of an endless belt as a heating component by the driving means, the configuration which makes it let out and run the fixing film of the long picture of the owner edge made into the roll volume.
[0220] 4) In for heating fixing of monochrome or an one-pass multicolor image, the fixing film 10 can also make it the thing of a gestalt which omitted the elastic layer 2. Moreover, it can also consider as the thing of a gestalt which also omitted the mold release layer 1. It can also consider as the thing of the lamination which added the stratum functionale of other requests.

[0221] 5) The pressurization member 30 can also be used as the member of other gestalten, such as not only a roller but a rotation belt mold.
[0222] Moreover, in order to supply heat energy to a recorded material also from the pressurization member 30 side, exoergic means, such as electromagnetic-induction heating, can be formed also in the pressurization member 30 side, and it can also be made predetermined temperature at heating and the equipment configuration which carries out temperature control.
[0223] 6) The heating apparatus of this invention is widely utilizable as the image heating apparatus which heats the recorded material which supported the image only as an image heating anchorage device of an example, and reforms front-face nature, such as luster, the image heating apparatus which carries out assumption arrival, equipment which heat-treats [lamination / desiccation,] other heated material.
[0224]
[Effect of the Invention] In the heating apparatus which has the heating component which has the metal layer in which according to this invention one field slides with supporter material and the field of another side heats a heated member in contact with a heated member as explained above, and this heating component By having prepared the metal layer which distributed either [at least] a ceramic particle or synthetic resin in the metal matrix in the supporter material of a heating component, and the field on which it slides, the sliding friction of a sliding surface with the supporter material of a heating component can be reduced, and the increment in the sliding friction by **** durability can be controlled further.
[0225] Therefore, since a slip of a heated member can be prevented, if conveyance of the stable heated member can be secured and it is in an image heating anchorage device, it becomes possible to offer conveyance of a high-definition image and the stable recorded material.
[0226] Furthermore, since a thing smaller than that of driving torque can be used as a drive motor of heating apparatus, it leads to reduction of product cost.

[Translation done.]

* NOTICES *

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1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

TECHNICAL FIELD

[Field of the Invention] This invention relates to a heating component, heating apparatus, and image formation equipment.
[0002] It is related with the heating apparatus equipped with the heating component to which one field slides with supporter material and the field of another side heats a heated member in contact with a heated member in more detail, and this heating component as a heating means of a heated member, and the image formation equipment equipped with this heating apparatus as image heating anchorage devices.
[0003] the image heating apparatus (a heating anchorage device --) which makes a recorded material carry out heat fixing of the non-established image which made the recorded material carry out formation support of the heating apparatus for example, in image formation equipment as a permanent fixing image in this invention They are a heating fixing assembly, the image heating apparatus to which assumption arrival of the non-established image is heated and carried out, the image heating apparatus which heats the recorded material which supported the image and reforms front-face nature, such as gloss, and equipment which heat-treats [lamination / desiccation,] other heated material.

[Translation done.]

PRIOR ART

[Description of the Prior Art] Hereafter, the image heating anchorage device of image formation equipment is made into an example, and is explained.
[0005] Conventionally, in image formation equipment, the equipment of a heat mechanical control by roller is widely used as an anchorage device which makes a recorded material side carry out heating fixing of the non-established toner image which carried out formation support indirectly [a recorded material] or directly with the proper image formation process means as a permanent fixing image. In recent years, although the equipment of a film heating method is put in practical use from the quick start or a viewpoint of energy saving, the equipment of the electromagnetic-induction heating method which makes the film itself which consists of a metal as a still more efficient anchorage device generate heat is proposed.
[0006] JP,51-109739,U is made to guide an eddy current to the metal layer of the fixing film as a heating component (heating element) by the alternating magnetic field, and the induction-heating anchorage device made to generate heat with the Joule's heat is indicated. This could make the direct fixing film generate heat by using generating of the induced current, and has attained the fixing process more efficient than the anchorage device of the heat mechanical control by roller which makes a halogen lamp a heat source.
[0007] However, since the energy of the alternate magnetic flux generated with the exiting coil as a magnetic field generating means is used for the temperature up of the whole fixing film, its heat loss is large. Therefore, the rate of the energy which acts on fixing to the supplied energy was low, and there was a fault that effectiveness was bad.
[0008] Then, in order are efficient and to obtain the energy which acts on fixing, the exiting coil was made to approach the fixing film which is a heating component, or alternate-magnetic-flux distribution of an exiting coil was centralized near the fixing nip section, and the efficient anchorage device was devised.
[0009] The outline configuration of an example of the anchorage device of the electromagnetic-induction heating method which made the fixing nip section concentrate alternate-magnetic-flux distribution of an exiting coil on drawing 11 , and raised effectiveness is shown.
[0010] 10 is the fixing film of the shape of a cylinder as a heating component which has an electromagnetic-induction exoergic layer (a conductor layer, a magnetic layer, resistor layer).
[0011] 16 is cross-section abbreviation half circular ** type film supporter material, and makes the outside of this film supporter material 16 have carried out outer fitting of the cylindrical fixing film 10 loosely.
[0012] 15 is the magnetic field generating means arranged inside the film supporter material 16, and consists of an exiting coil 18 and a magnetic core (core material) 17 of E mold.
[0013] 30 is an elastic pressurization roller, it makes the fixing film 10 insert, makes the fixing nip section N of predetermined width of face (heating nip section) form with the inferior surface of tongue of the film supporter material 16, and predetermined contact pressure, and has carried out the mutual pressure welding. The magnetic core 17 of said magnetic field generating means 15 is made to correspond to the fixing nip section N, and is arranged.
[0014] The rotation drive of the pressurization roller 30 is carried out by the driving means M at the counterclockwise rotation of ****. By the rotation drive of this pressurization roller 30, turning effort acts on the fixing film 10 by the frictional force of said pressurization roller 30 and external surface of the fixing film 10. Said fixing film 10 rotates the periphery of the film supporter material 16 with the peripheral velocity corresponding to the peripheral velocity of the pressurization roller 30 of **** mostly clockwise, while the inside sticks to the inferior surface of tongue of the film supporter material 16 and slides in the fixing nip section N (pressurization roller drive method).

[0015] The film supporter material 16 carries out the duty which plans conveyance stability at the time of the pressurization to the fixing nip section N, the exiting coil 18 as a magnetic field generating means 15 and support of the magnetic core 17, support of the fixing film 10, and rotation of the fixing film 10. This film supporter material 16 is an insulating member which does not bar passage of magnetic flux, and the ingredient which can bear a high load is used.
[0016] The schematic diagram of the lamination of the fixing film 10 as a heating component is shown in drawing 12 . The fixing film 10 is a complex film which has the mold release layer 1, the elastic layer 2, and the exoergic layer 3 in order inside from an outside. The mold release layer 1 consists of good fluororesins of mold-releases characteristic, such as PFA, etc. The elastic layer 2 consists of synthetic rubber which is rich in the elasticity of silicone rubber etc. The exoergic layer 3 is a layer which carries out self-generation of heat according to the eddy current by electromagnetic induction, and consists of ferromagnetic metals, such as nickel. Although non-magnetic metal may be used for this exoergic layer 3, exoergic effectiveness falls compared with the case where a ferromagnetic metal is used.
[0017] An exiting coil 18 generates alternate magnetic flux according to the alternation current supplied from a non-illustrated excitation circuit. Alternate magnetic flux is intensively distributed over the fixing nip section N with the magnetic core 17 of E mold corresponding to the location of the fixing nip section N, and the alternate magnetic flux makes the exoergic layer 3 of the fixing film 10 generate an eddy current in the fixing nip section N. This eddy current makes the exoergic layer 3 generate the Joule's heat with the specific resistance of an electromagnetic-induction exoergic layer.
[0018] Electromagnetic-induction generation of heat of this fixing film 10 is intensively produced in the fixing nip section N over which alternate magnetic flux was distributed intensively, and the fixing nip section N is heated efficient.
[0019] Temperature control of the temperature of the fixing nip section N is carried out so that temperature predetermined by the current supply source to an exiting coil 18 being controlled by the temperature control control system including a temperature detection means (un-illustrating) may be maintained.
[0020] It **, the rotation drive of the pressurization roller 30 is carried out, the fixing film 10 of the shape of a cylinder as a heating component rotates the periphery of the film supporter material 16 in connection with it, electromagnetic-induction generation of heat of the fixing film 10 is made as mentioned above by the electric supply to the exiting coil 18 from an excitation circuit, and the fixing nip section N starts to predetermined temperature. And the recorded material P with which the non-established toner image t conveyed from the image formation means section (un-illustrating) was formed in the condition that temperature control was carried out Between the fixing film 10 of the fixing nip section N, and the pressurization roller 30, upward, i.e., a fixing film plane, an image side counters, and is introduced, in the fixing nip section N, an image side sticks to the external surface of the fixing film 10, and pinching conveyance is carried out in the fixing nip section N together with the fixing film 10. In the process in which pinching conveyance of the recorded material P is carried out together with the fixing film 10 in this fixing nip section N, the fixing film 10 is heated and heating fixing of the non-established toner image t on a recorded material P is carried out. After passing the fixing nip section N, from the peripheral face of the fixing film 10, a recorded material P separates and is conveyed.

[Translation done.]

EFFECT OF THE INVENTION

[Effect of the Invention] In the heating apparatus which has the heating component which has the metal layer in which according to this invention one field slides with supporter material and the field of another side heats a heated member in contact with a heated member as explained above, and this heating component By having prepared the metal layer which distributed either [at least] a ceramic particle or synthetic resin in the metal matrix in the supporter material of a heating component, and the field on which it slides, the sliding friction of a sliding surface with the supporter material of a heating component can be reduced, and the increment in the sliding friction by **** durability can be controlled further.
[0225] Therefore, since a slip of a heated member can be prevented, if conveyance of the stable heated member can be secured and it is in an image heating anchorage device, it becomes possible to offer conveyance of a high-definition image and the stable recorded material.
[0226] Furthermore, since a thing smaller than that of driving torque can be used as a drive motor of heating apparatus, it leads to reduction of product cost.

[Translation done.]

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] However, there were the following problems in the anchorage device of a configuration of that the inner skin of the fixing film 10 as a heating component which was stated above slides with the front face of the film supporter material 16.
[0022] That is, in order that the inside of said fixing film 10 and the front face of the film supporter material 16 may carry out rubbing of the time of rotation of the fixing film 10 in the fixing nip section N, the sliding nature between the inside of the fixing film 10 and the front face of the film supporter material 16 influences the driving torque of an anchorage device greatly. If this sliding nature is bad in pressurization roller 30 drive, the sliding friction of the fixing film 10 and the film supporter material 16 will become large, and it will especially be easy to generate a slip between the fixing film 10 and the pressurization roller 30 of a drive means of communication. It is easy to generate a slip between the recorded materials P and the pressurization rollers 30 which are especially conveyed with the fixing film 10 at the time of ****.
[0023] This sliding friction is so large that the welding pressure concerning the fixing nip section N is large. When using especially as an anchorage device of full color image formation equipment with much toner ******, in order to raise fixable, it is necessary to enlarge welding pressure and to take large nip width of face from the anchorage device of mono-color picture formation equipment. Moreover, in order to raise the permeability of the color toner image on an OHP film, it is necessary to enlarge welding pressure, to make higher planar pressure in the fixing nip section N, and to graduate a toner image front face. Thus, if it is used as an anchorage device of full color image formation equipment, since welding pressure is high, a sliding friction will be large and it will become remarkable slip generating it.
[0024] When a slip is generated at the time of **** of the recorded material P which carried the toner image t, the toner image t is disturbed by superfluous heat supply and a superfluous slip, and the remains of a slip occur on an image. Moreover, it is easy to generate a jam with this slip, without the ability of the delivery timing of the recorded material P in an anchorage device delivering paper well behind time. Furthermore, since the big driving torque to the drive motor of an anchorage device was required so that the sliding friction at the time of rotation of the fixing film 10 is large, there was a problem on which the cost of a drive motor goes up.
[0025] In order to solve the above problems, there is a method of making the sliding friction at the time of rotation of the fixing film 10 mitigate by making lubricant, such as high temperature grease, intervene between the inner skin of the fixing film 10, and the film supporter material 16 as proposed by JP,5-27619,A.
[0026] However, if it continues using high temperature grease under an elevated temperature like the interior of an anchorage device, grease will deteriorate, or the amount of grease distributed over the fixing nip section N which is the sliding section will decrease, and lubricity will be lost. furthermore, the crack at the time of sliding of the metal layer of the inner skin of the fixing film 10 depended for the ability deleting -- the -- it can delete and lubricity is lost also for powder. Thus, even if it applies high temperature grease, the condition that a sliding friction is low does not last long, but has the inclination which a sliding friction increases gradually. Therefore, there was a problem on which conveyance of a recorded material P becomes unstable, slips of a recorded material P occur frequently, and the jams in a poor image and an anchorage device occur frequently, so that it continued using an anchorage device.
[0027] Therefore, it is necessary to raise the lubricity of the inside of the fixing film 10 as a heating component, or the front face of film supporter material 16 the very thing, without depending on spreading of said lubricant.
[0028] Then, this invention reduces a sliding friction with the supporter material of the heating component to which one field slides with supporter material and the field of another side heats a heated member in contact with a heated member, and aims at controlling the increment in the sliding friction by **** durability further.

[Translation done.]

MEANS

[The means which invention is going to solve] This invention is the heating component, heating apparatus, and image formation equipment which are characterized by the configuration described below.
[0030] (1) The heating component which is a heating component to which one field slides with supporter material and the field of another side heats a heated member in contact with a heated member, and is characterized by preparing the metal layer which distributed either [at least] the ceramic particle or the synthetic-resin particle in the metal matrix in supporter material and the field on which it slides.
[0031] (2) It is the heating component to which one field slides with supporter material and the field of another side heats a heated member in contact with a heated member. It is the heating component which prepares the metal layer which distributed either [at least] the ceramic particle or the synthetic-resin particle in the metal matrix in supporter material and the field on which it slides, and is characterized by the supporter material side of this layer carrying out the laminating of the metal layer which consists of a single metal or an alloy at an opposite side side further.
[0032] (3) It is a heating component given in (1) which the ceramic particle distributed in said metal matrix consists of at least one kind in the graphite which also spreads boron nitride, or molybdenum disulfide, and is characterized by the particle size being 0.1-10 micrometers.
[0033] (4) It is a heating component given in (2) which the ceramic particle distributed in said metal matrix consists of at least one kind in the graphite which also spreads boron nitride, or molybdenum disulfide, and is characterized by the particle size being 0.1-10 micrometers.
[0034] (5) A heating component given in (1) characterized by all the contents of a ceramic particle being 0.2 - 20 % of the weight in the metal layer by which said ceramic particle is distributed in said metal matrix, or (3).
[0035] (6) A heating component given in (2) characterized by all the contents of a ceramic particle being 0.2 - 30 % of the weight in the metal layer by which said ceramic particle is distributed in said metal matrix, or (4).
[0036] (7) It is a heating component given in (1) which the synthetic-resin particle distributed in said metal matrix consists of a fluororesin, and is characterized by the particle size being 0.1-10 micrometers.
[0037] (8) It is a heating component given in (2) which the synthetic-resin particle distributed in said metal matrix consists of a fluororesin, and is characterized by the particle size being 0.1-10 micrometers.
[0038] (9) A heating component given in (1) characterized by all the contents of a synthetic-resin particle being two to 40 volume %s in the metal layer by which said synthetic-resin particle is distributed, or (7).
[0039] (10) A heating component given in (2) characterized by all the contents of a synthetic-resin particle being two to 50 volume %s in the metal layer by which said synthetic-resin particle is distributed, or (8).
[0040] (11) The metal matrix by which said particle is distributed is a heating component given in any of (1) to (10) characterized by being nickel or a nickel radical alloy they are.
[0041] (12) A heating component given in any of (1) to (11) characterized by having the layer which carries out electromagnetic-induction generation of heat according to an operation of an alternating magnetic field they are.

[0042] (13) A heating component given in any of (1) to (12) characterized by having a mold release layer on the front face by the side of a heated member they are.
[0043] (14) A heating component given in any of (1) to (13) characterized by being body of revolution they are.

[0044] (15) A heating component given in any of (1) to (13) characterized by being endless film-like body of revolution they are.
[0045] (16) Heating apparatus characterized by having a heating component given [as a heating component

which heats a heated member] in any of (1) to (15) they are.
[0046] (17) Heating apparatus characterized by a heating component being a heating component given in any of (1) to (15) they are in the heating apparatus which has the heating component to which one field slides with supporter material, and the field of another side touches a heated member, and heats a heated member by this heating component.
[0047] (18) The heating component to which one field slides with supporter material, and the field of another side touches a heated member, In the heating apparatus which has the pressurization member which carries out a pressure welding to supporter material through this heating component, and forms nip, carries out pinching conveyance of the heated member between the heating component of said nip section, and a pressurization member, and heats a heated member by the heating component Heating apparatus characterized by a heating component being a heating component given in any of (1) to (15) they are.
[0048] (19) Said heating component is heating apparatus given in (18) characterized by following and driving to a pressurization member or a pressure-welding member by friction of the front face of the pressure-welding member and heating component which carry out a pressure welding to said pressurization member or a heating component peripheral face.
[0049] (20) Heating apparatus given in any of (16) to (19) which said heated member is a recorded material which supported the non-established toner image, and is characterized by carrying out heat fixing of the non-established toner image by the heat of a heating component at a recorded material they are.
[0050] (21) Heating apparatus given in any of (16) to (20) characterized by having a means to make an alternating magnetic field act and to carry out electromagnetic-induction generation of heat of said heating component they are.
[0051] (22) Image formation equipment characterized by a heating fixing means being heating apparatus given in any of (16) to (21) they are in the image formation equipment which has an image formation means to form a non-established toner image in a recorded material, and a heating fixing means to make a recorded material carry out heat fixing of the non-established toner image.
[0052] (23) Said image formation equipment is image formation equipment given in (22) characterized by color picture formation being possible.
[0053] <** **> -- lubricity boils markedly the metal layer which made the metal matrix distribute either [at least] a ceramic particle or a synthetic-resin particle, and is superior to the metal layer which does not carry out distributed content of a ceramic particle or the synthetic-resin particle. Moreover, abrasion resistance also improves.
[0054] In the heating apparatus which has the heating component which has the metal layer in which one field slides on this invention with supporter material, and the field of another side heats a heated member in contact with a heated member, and this heating component By having prepared the metal layer which distributed either [at least] a ceramic particle or synthetic resin in the metal matrix in the supporter material of a heating component, and the field on which it slides, the sliding friction of a sliding surface with the supporter material of a heating component can be reduced, and the increment in the sliding friction by **** durability can be controlled further.
[0055] Therefore, since a slip of a heated member can be prevented, if conveyance of the stable heated member can be secured and it is in an image heating anchorage device, it becomes possible to offer conveyance of a high-definition image and the stable recorded material.
[0056] Furthermore, since a thing smaller than that of driving torque can be used as a drive motor of heating apparatus, it leads to reduction of product cost.
[0057]
[Embodiment of the Invention] The operation gestalt of this invention is explained below.

[Translation done.]

* NOTICES *

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1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

EXAMPLE

<The 1st example> (drawing 1 - drawing 9)
(1) Example drawing 1 of image formation equipment is the configuration schematic drawing of an example of image formation equipment. The image formation equipment of this example is the color laser beam printer of electrophotography process use.
[0059] 101 is the photoconductor drum made with the organic photo conductor and amorphous silicon photo conductor as image support, and a rotation drive is carried out at a predetermined process rate (peripheral velocity) at the counterclockwise rotation of ****.
[0060] A photoconductor drum 101 receives uniform electrification processing of a polarity and potential predetermined in the rotation process with the electrification equipments 102, such as an electrification roller.
[0061] Subsequently, the laser beam 103 outputted to the electrification processing side from the laser optical box (laser scanner) 110 receives scan exposure processing of image information. The laser optical box 110 outputs the laser beam 103 modulated corresponding to the time series electrical-and-electric-equipment digital pixel signal of the image information from picture signal generators, such as a non-illustrated image reader, (ON/OFF), carries out scan exposure and carries out the 101st page of a photoconductor drum. Thereby, the electrostatic latent image corresponding to image information is formed in a photoconductor drum side. 109 is a mirror which makes the exposure location of a photoconductor drum 101 deflect the output laser beam from the laser optical box 110.
[0062] In the case of full color image formation, the scan exposure and latent-image formation about the 1st target color-separation component image, for example, yellow component image, of a full color image are made, and the latent image is developed as a yellow toner image by actuation of yellow development counter 104Y of the 4 color color developers 104. The yellow toner image is imprinted by the 105th page of a middle imprint drum in the primary imprint section T1 which is the contact section (or contiguity section) of a photoconductor drum 101 and the middle imprint drum 105. The 101st page of the photoconductor drum after the toner image imprint to the 105th page of a middle imprint drum is cleaned by the cleaner 107 in response to removal of the adhesion residues, such as a transfer residual toner.
[0063] The above process cycles of electrification / scan exposure, development, a primary imprint, and cleaning the 2nd color-separation component image (for example, a Magenta component image --) of the target full color image Magenta development counter 104M -- actuation and the 3rd color-separation component image (for example, a cyanogen component image --) cyanogen development counter 104C -- actuation and the 4th color-separation component image (for example, a black component image --) Sequential execution of the black development counter 104BK is carried out about each color-separation component image of actuation. The toner image of four colors of a yellow toner image, a Magenta toner image, a cyanogen toner image, and a black toner image is imprinted one by one in piles by the 105th page of a middle imprint drum, and the color toner image corresponding to the target full color image is formed.
[0064] It is what prepared the elastic layer of inside resistance, and the surface of high resistance in metal drum lifting, and a photoconductor drum 101 is contacted, or it approaches, the rotation drive of the **** is clockwise carried out with the same peripheral velocity as a photoconductor drum 101, and the middle imprint drum 105 gives bias potential to the metal drum of the middle imprint drum 105, and makes the toner image by the side of a photoconductor drum 101 imprint to the 105th page side of said middle imprint drum by the potential difference with a photoconductor drum 101.
[0065] The color toner image formed in the 105th page of the above-mentioned middle imprint drum is imprinted by the field of the recorded material P sent into said secondary imprint section T2 from the non-

illustrated feed section to predetermined timing in the secondary imprint section T2 which is the contact nip section of said middle imprint drum 105 and imprint roller 106. The imprint roller 106 carries out the package imprint of the synthetic color toner image from the 105th page side of a middle imprint drum one by one to a recorded material P side by supplying a toner and the charge of reversed polarity from the tooth back of a recorded material P.
[0066] It dissociates from the 105th page of a middle imprint drum, and the recorded material P which passed the secondary imprint section T2 is introduced to an anchorage device (image heating apparatus) 100, and is discharged in response to heating fixing processing of a non-established toner image by the paper output tray which is not illustrated [outside the plane]. An anchorage device 100 is explained in full detail by the following (2) terms.
[0067] The middle imprint drum 105 after the color toner image imprint to a recorded material P is cleaned by the cleaner 108 in response to removal of the adhesion residues, such as a transfer residual toner and paper powder. This cleaner 108 is held in the non-contact condition at the middle imprint drum 105, and is always held in the contact condition at the middle imprint drum 105 in the secondary imprint activation process of a color toner image over a recorded material P from the middle imprint drum 105.
[0068] Moreover, the imprint roller 106 is also always held in the non-contact condition at the middle imprint drum 105, and it is held in the contact condition through a recorded material P at the middle imprint drum 105 in the secondary imprint activation process of a color toner image over a recorded material P from the middle imprint drum 105.
[0069] The image formation equipment of this example can also perform the printing mode of mono-color pictures, such as monochrome image. Moreover, a double-sided image printing mode can also be performed.
[0070] A double-sided image print is outputted by front flesh-side reversal being carried out through the recycling conveyance device in which it does not illustrate, and the recorded material [finishing / the image print of the 1st side] P to which it came out of the anchorage device 100 in the case of the double-sided image printing mode being again sent into the secondary imprint section T2, and receiving the toner image imprint to the 2nd page, and it being introduced into an anchorage device 100 and receiving the fixing processing of a toner image to the 2nd page again.
[0071] (2) The anchorage device 100 as heating apparatus in anchorage device 100 this example is equipment of an electromagnetic-induction heating method. The transverse-plane model Fig. of an important section and drawing 4 of the crossing side-face model Fig. of the important section of the anchorage device 100 of this example [drawing 2] and drawing 3 are the vertical section model Figs. of an important section.
[0072] The anchorage device 100 of this example is equipment of a pressurization roller drive method and an electromagnetic-induction heating method using the fixing film of the shape of a cylinder of electromagnetic-induction febrility as a heating component like the anchorage device of above-mentioned drawing 11 . The same sign is given to the equipment of drawing 11 , and common common configuration member and part, and explanation for the second time is omitted.
[0073] A magnetic field generating means consists of magnetic core 17a, 17b, 17c, and an exiting coil 18.
[0074] It is the member of high permeability, and magnetic core 17a, 17b, and 17c have the good ingredient used for the core of transformers, such as a ferrite and a permalloy, and is good to use a ferrite with little [it is more desirable and] loss of at least 100kHz or more.
[0075] The excitation circuit 27 (drawing 5) is connected to the exiting coil 18 at electric supply section 18a and 18b. This excitation circuit 27 can generate now 20 to 500kHz high frequency in switching power supply.
[0076] An exiting coil 18 generates alternate magnetic flux according to the alternation current (high frequency current) supplied from the excitation circuit 27.
[0077] 16a and 16b are cross-section abbreviation half circular ** type film supporter material, oppose an opening side mutually, constitute an approximate circle prism, and make the outside have carried out outer fitting of the fixing film 10 of the shape of a cylinder which is a heating component loosely.
[0078] Said film supporter material 16a holds magnetic core 17a, 17b and 17c as a magnetic field generating means, and an exiting coil 18 inside. Moreover, the right heat-conduction member 40 which makes a space perpendicular direction straight side like drawing 4 at film supporter material 16a is arranged inside the fixing film 10 by the opposed face side with the pressurization roller 30 of the fixing nip section N.
[0079] This right pyroductivity member 40 is a member which supports the fixing film 10 from that inner skin to the welding pressure of the pressurization roller 30 in the fixing nip section N. Aluminum is used for the right

thermal-conductivity member 40 in this example. Thermal conductivity k is k= 240 [W-m -1 and K-1], and said good heat-conduction member 40 is thickness 1 [mm]. Moreover, the right heat-conduction member 40 is arranged out of this magnetic field so that it may not be influenced of the exiting coil 18 which is a magnetic field generating means, and the magnetic field generated from magnetic core 17a, 17b, and17c. You specifically arrange the right heat-conduction member 40 in the location which separated magnetic core 17c to the exiting coil 18, you make it located in the outside of the magnetic path by the exiting coil 18, and he is trying not to affect the right heat-conduction member 40.

[0080] 22 is the oblong rigid stay for pressurization which the inside flat-surface section and the right heat-conduction member 40 of film supporter material 16b were made to contact, and was arranged.

[0081] 19 is an insulating member for insulating between the rigid stays 22 for pressurization with magnetic core 17a, 17b, 17c, and an exiting coil 18.

[0082] Flange material 23a and 23b are attached outside the right-and-left both ends of the assembly of film supporter material 16a and 16b, it is attached free [rotation], fixing said right-and-left location, and carries out the duty which regulates the approach migration which meets film supporter material 16 straight side of the fixing film 10 in response to the edge of said fixing film 10 at the time of rotation of the fixing film 10.

[0083] The pressurization roller 30 as a pressurization member is constituted from heat-resistant elastic material layer 30b which carried out shaping covering, such as a silicone rubber fluororubber fluororesin, by the shape of a roller at this cardiac one at rodding 30a and the circumference of said rodding, and rotation freedom is made to carry out bearing maintenance, and it is arranged in chassis side plate Kanema whose both ends of rodding 30a are not illustrated [of equipment] at it.

[0084] It depresses to the configuration stay 22 for pressurization by ****(ing) pressurization spring 25a and 25b, respectively between the both ends of the rigid stay 22 for pressurization, and spring receptacle member 29a and 29b by the side of an equipment chassis, and the force is made to act. The inferior surface of tongue of the good heat-conduction member 40 and the top face of the pressurization roller 30 carry out a pressure welding on both sides of the fixing film 10 by this, and the fixing nip section N of predetermined width of face is formed.

[0085] The rotation drive of the pressurization roller 30 is carried out by the driving means M (drawing 2) at the counterclockwise rotation of ****. By the rotation drive of this pressurization roller 30, turning effort acts on the fixing film 10 by the frictional force of said pressurization roller 30 and external surface of the fixing film 10, and while the inner skin of said fixing film 10 sticks and slides on the inferior surface of tongue of the right heat-conduction member 40 in the fixing nip section N, the periphery of film supporter material 16a and 16b is clockwise rotated mostly with the peripheral velocity corresponding to the peripheral velocity of the pressurization roller 30 of ****.

[0086] When the right heat-conduction member 40 has the effectiveness which makes the temperature distribution of a longitudinal direction homogeneity, for example, small size paper is ****(ed), the heating value of the non-paper-feed-section in the fixing film 10 carries out heat transfer to the right heat-conduction member 40, and heat transfer of the heating value of a non-paper-feed-section is carried out by heat conduction of the longitudinal direction in the right heat-conduction member 40 to small size ********. Thereby, the effectiveness of reducing the power consumption at the time of small size ****** is also acquired.

[0087] Moreover, as shown in drawing 5 , keep predetermined spacing in the longitudinal direction, make the peripheral surface of film supporter material 16a carry out formation possession of the convex rib section 16c, it is made to reduce the contact sliding friction of the peripheral surface of film supporter material 16a, and the inside of the fixing film 10, and the rotation load of the fixing film 10 is lessened. Formation possession of such convex rib section 16c can be carried out also like film supporter material 16b.

[0088] Drawing 6 expresses the situation of generating of alternate magnetic flux typically. Magnetic flux C expresses a part of generated alternate magnetic flux. The alternate magnetic flux C led to magnetic core 17a, 17b, and 17c makes the electromagnetic-induction exoergic layer of the fixing film 10 generate an eddy current between magnetic core 17a and magnetic core 17b and between magnetic core 17a and magnetic core 17c. This eddy current makes an electromagnetic-induction exoergic layer generate the Joule's heat (eddy current loss) with the specific resistance of an electromagnetic-induction exoergic layer. the consistency of the magnetic flux by which the calorific value Q here passes along an electromagnetic-induction exoergic layer -- being decided -- the graph of drawing 6 -- distribution [like] is shown.

[0089] The graph of drawing 6 shows the location of the circumferencial direction in the fixing film 10 which

expressed with the include angle theta to which the axis of ordinate set the core of magnetic core 17a to 0, and an axis of abscissa shows the calorific value Q in the electromagnetic-induction exoergic layer of the fixing film 10. Here, when the maximum calorific value is set to Q, calorific value defines the exoergic region H as the field more than Q/e. This is a field where calorific value required for fixing is obtained.

[0090] Temperature control of the temperature of this fixing nip section N is carried out so that temperature predetermined by the current supply source to an exiting coil 18 being controlled by the temperature control system including a temperature detection means by which it does not illustrate may be maintained.

[0091] 26 (drawing 2) is temperature sensors, such as a thermistor which detects the temperature of the fixing film 10, and he is trying to control the temperature of the fixing nip section N based on the temperature information on the fixing film 10 measured with the temperature sensor 26 in this example.

[0092] In the condition that **(ed), the fixing film 10 rotated, electromagnetic-induction generation of heat of the fixing film 10 was made as mentioned above by the electric supply to an exiting coil 18 from the excitation circuit 27, and temperature control of the fixing nip section N was started and carried out to predetermined temperature An image side between the fixing film 10 of the fixing nip section N, and the pressurization roller 30 Facing up, [the recorded material P with which the non-established toner image t conveyed from the image formation means section was formed] That is, it is introduced into a fixing film plane face to face, and in the fixing nip section N, an image side sticks to the external surface of the fixing film 10, and pinching conveyance is carried out in the fixing nip section N together with the fixing film 10. In the process in which pinching conveyance of the recorded material P is carried out together with the fixing film 10 in this fixing nip section N, it is heated by electromagnetic-induction generation of heat of the fixing film 10, and heating fixing of the non-established toner image t on a recorded material P is carried out. If the fixing nip section N is passed, it dissociates from the external surface of the fixing film 10, and discharge conveyance of the recorded material P is carried out. After passing the fixing nip section N, it cools and the heating fixing toner image t on a recorded material P turns into a permanent fixing image.

[0093] The width of face of the shortest of the fixing nip section N of the anchorage device 100 of full color image formation equipment is [7.0mm or more] desirable in order to fully secure fixable [of a full color image with much toner ******]. Since sufficient heating value for fixing cannot be given to the non-established toner t and a recorded material P as it is less than [this], poor fixing will occur. Moreover, in order to fully secure the permeability of the full color image of an OHP film, the planar pressure of the fixing nip section N is 0.8 kgf/cm2 further. The above is desirable. Since the toner layer t front face to which it was fixed that it is less than [this] cannot be made smooth enough, scattered reflection light will increase and the amount of transmitted lights of the image section on an OHP film will decrease.

[0094] The pressurization roller 30 and the fixing film 10 are made to pressurize by 21kgf(s) with the anchorage device 100 of this example from the above viewpoint, and it is the planar pressure of about 8.0mm and the fixing nip section N about the width of face of the fixing nip section N 1.2 kgf/cm2 It carried out (the die length of the longitudinal direction of the fixing nip section N is 220mm).

[0095] In this example, as shown in drawing 2 , in order to intercept the electric supply to the exiting coil 18 at the time of an overrun in the opposite location of the exoergic region H of the fixing film 10 (drawing 6), the thermo switch 50 which is a temperature detector element is arranged.

[0096] Drawing 7 is the circuit diagram of the safety circuit used by this example. The thermo switch 50 which is a temperature detector element is connected with the DC power supply of 24V, and the relay switch 51 at the serial, if a thermo switch 50 is turned off, the electric supply to a relay switch 51 was intercepted, the relay switch 51 operated, and the configuration which intercepts the electric supply to an exiting coil 18 is taken by intercepting the electric supply to the excitation circuit 27. The thermo switch 50 set OFF operating temperature as 220 degrees C.

[0097] Moreover, the thermo switch 50 countered the exoergic region H of the fixing film 10, and was arranged in the external surface of the fixing film 10 non-contact. Distance between a thermo switch 50 and the fixing film 10 was set to about 2mm. Thereby, the blemish by contact of a thermo switch 50 is not attached to the fixing film 10, and degradation of the fixing image by durability can be prevented.

[0098] Even when an anchorage device stops where paper is caught in the fixing nip section N, electric supply is continued by the exiting coil 18 and the fixing film 10 continues generating heat [according to this example] at the time of the anchorage device overrun by equipment failure unlike the configuration which generates heat in the fixing nip section N like the equipment of above-mentioned drawing 11 , since it is not not exoergic, in

the fixing nip section N in which paper has been caught, paper is not heated directly. Moreover, since the thermo switch 50 was arranged in the exoergic region H with much calorific value, when the thermo switch 50 has sensed 220 degrees C and the thermo switch was turned off, the electric supply to an exiting coil 18 is intercepted by the relay switch 51.

[0099] According to this example, the ignition temperature of paper can stop generation of heat of the fixing film 10, without paper igniting, since it is nearly about 400 degrees C.

[0100] The thermal fuse other than a thermo switch can also be used as a temperature detector element.

[0101] In this example, since the toner which made Toner t contain the low softening matter was used, the oil spreading device for offset prevention has not been prepared in an anchorage device 100, but when the toner which is not making the low softening matter contain is used, an oil spreading device may be established. Moreover, also when the toner which made the low softening matter contain is used, oil spreading and cooling separation may be performed.

[0102] A) As a lead wire (electric wire) which makes a coil (coil) constitute, using that (pencil) to which one bundled at a time two or more copper thin lines by which pre-insulation was carried out, respectively, the exiting coil 18 exiting coil 18 rolls this two or more times, and forms the exiting coil. In this example, 10 turn ****** exiting coil 18 is formed.

[0103] Pre-insulation is good to use covering which has thermal resistance in consideration of heat conduction by generation of heat of the fixing film 10. For example, it is good to use covering of amide imide, polyimide, etc.

[0104] An exiting coil 18 may apply a pressure from the exterior, and may raise tight ness.

[0105] He is trying for the configuration of an exiting coil 18 to meet the curved surface of an exoergic layer like drawing 2 . In this example, the distance between the exoergic layer of the fixing film 10 and an exiting coil 18 was set up so that it might be set to about 2mm.

[0106] As the quality of the material of the exiting coil attachment component 19, it excels in insulation, and what has good thermal resistance is good. For example, it is good to choose phenol resin, a fluororesin, polyimide resin, polyamide resin, polyamidoimide resin, PEEK resin, PES resin, PPS resin, PFA resin, PTFE resin, an FEP resin, LCP resin, etc.

[0107] Although it is [the absorption efficiency of magnetic flux] higher to bring the distance between the magnetic cores 17a, 17b, and 17c and an exiting coil 18, and the exoergic layer of the fixing film 10 close as much as possible, since this effectiveness will fall remarkably if this distance exceeds 5mm, it is good to make it less than 5mm. Moreover, if it is less than 5mm, the exoergic layer of the fixing film 10 and the distance of an exiting coil 18 do not need to be fixed.

[0108] Pre-insulation has been performed [leader line / (drawing 5) /, i.e., 18aand18b, / from the exiting coil attachment component 19 of an exiting coil 18] to the outside of a pencil about the outer part from the exiting coil attachment component 19.

[0109] B) Fixing film 10 drawing 8 is the lamination model Fig. of the fixing film 10 in this example.

[0110] The fixing film 10 of this example is characterized by having formed the lubricative exoergic layer 5 which consists of metals with which the ceramic particle was distributed by film inner skin. It is the fixing film 10 of the composite construction which carried out the laminating of the mold release layer 1 to the peripheral face of this lubricative exoergic layer 5 further with the elastic layer 2 at that peripheral face.

[0111] While this lubricative exoergic layer 5 functions as an electromagnetic-induction exoergic layer, the lubricity of the inner skin of the fixing film 10 of the shape of a cylinder as a heating component is raised.

[0112] A primer layer (un-illustrating) may be prepared between each class for adhesion between the lubricative exoergic layer 5 and the elastic layer 2, and adhesion between the elastic layer 2 and the mold release layer 1.

[0113] In the fixing film 10 which is a cylindrical shape-like, the lubricative exoergic layer 5 is a film guide contact surface side, and the mold release layer 1 is a pressurization roller contact surface side. As mentioned above, in alternate magnetic flux acting on the lubricative exoergic layer 5 which serves also as the role of an exoergic layer, an eddy current occurs in the lubricative exoergic layer 5, and said lubricative exoergic layer 5 generates heat. The recorded material P with which the heat which carried out induction generation of heat in this layer heats the fixing film 10 whole through elastic layer 2 and the mold release layer 1, and is ****(ed) by the fixing nip section N is heated, and heating fixing of a toner t image is made.

[0114] a. Nickel, iron, ferromagnetism SUS, a ferromagnetic metal called a nickel-cobalt alloy, or non-magnetic metal called aluminum is sufficient as the matrix metal which forms the lubricative exoergic layer 5 lubricity

exoergic layer 5.
[0115] Moreover, paying attention to the improvement in endurance of the inner skin of the fixing film 10, the wear-resistant high alloy of nickel-Lynn, nickel-Lynn-boron, etc. is sufficient.
[0116] Moreover, when nickel is used for a matrix metal, in order to prevent the metal fatigue by the crookedness stress of the repeat received at the time of rotation of the fixing film 10, it is also good in nickel to add manganese.
[0117] Since the lubricative exoergic layer 5 has the operation as a lubricating layer and an exoergic layer, its ferromagnetic metal which carries out electromagnetic-induction generation of heat more efficient than non-magnetic metal is [a matrix metal] desirable. Nickel with comparatively easy production by electrolysis plating or nonelectrolytic plating or a nickel radical alloy is desirable more preferably.
[0118] In these metal matrices, the lubricative exoergic layer 5 is distributing a ceramic particle, and has not only electromagnetic-induction generation of heat but the operation on the lubrication disposition of the inner skin of the fixing film 10.
[0119] Therefore, as for this ceramic particle, what has low coefficient of friction is good, and its high ceramics of self-lubricity is desirable. As high ceramics of self-lubricity, the boron nitride, graphite, and molybdenum disulfide with which a crystal structure makes the layer structure by the hexagonal lattice are good. Among these, when creating the lubricative exoergic layer 5 with electrolysis plating, the boron nitride which is what it is easy to distribute in electrocasting is more desirable.
[0120] Moreover, the abrasion resistance of the lubricative exoergic layer 5 can also be raised by distributing a ceramic particle. Therefore, since it is based on the sliding friction of fixing film inner skin, and metaled wear, it can delete and powder can be reduced, the sliding friction of the fixing film 10, and the right heat-conduction member 40 and film supporter material 16 can be reduced over a long period of time.
[0121] The particle size of these ceramic particles has desirable 0.1-10 micrometers. Sufficient lubricity cannot be obtained even if too little, even when it is more excessive than this. Moreover, when the thickness of the lubricative exoergic layer 5 by which these particles are distributed is thinner than 10 micrometers, as for the maximum grain size of a particle, it is desirable not to exceed this thickness. When particle size is larger than thickness, the irregularity of a particle occurs on a front face and there is a possibility that the fixing film 10 may deform with the pressure welding in the fixing nip section N.
[0122] Although the content of a ceramic particle can be set up suitably if needed, 0.2 - 20 % of the weight is desirable. The effectiveness of the lubricity and the wear-resistant improvement by the ceramic particle distributed as it is 0.2 or less % of the weight is seldom accepted. Moreover, if the content of a ceramic particle exceeds 20 % of the weight, since the composite-coatings coat obtained will become weak, exoergic effectiveness will fall not only flexibility falls, but and fixing capacity will decline, it is not desirable.
[0123] The thickness of the lubricative exoergic layer 5 is thicker than the skin depth expressed with the following formula, and it is desirable to make it 200 micrometers or less. Skin depth sigma [m] is expressed in frequency [of an excitation circuit] f [Hz], permeability mu, and specific resistance rho [omegam] as sigma=503x(rho/fmu) 1/2.
[0124] This shows the depth of absorption of the electromagnetic wave used by electromagnetic induction, and it is shown in a place deeper than this that the reinforcement of an electromagnetic wave has become below 1/e. Conversely, if it says, almost all energy is absorbed even in this depth (drawing 9 R> 9).
[0125] The thickness of the lubricative exoergic layer 5 has 1 micrometers or more preferably good 100 micrometers or less. If the thickness of the lubricative exoergic layer 5 is thinner than 1 micrometer, since almost all electromagnetic energy cannot be absorbed, effectiveness will worsen. Moreover, for rigidity becoming high too much, if the lubricative exoergic layer 5 exceeds 100 micrometers, and flexibility worsening, and using it as body of revolution, it is not realistic.
[0126] The lubricative exoergic layer 5 (boron nitride particle distribution nickel) which is the description of this invention is compound electrocasting obtained by the electrolysis galvanizing method. The lubricative exoergic layer 5 was produced on conditions which are described below. First, nickel amiosulfonate, SHUU-ized nickel, boric acid, and the water solution that blended the boron nitride particle were prepared, after performing electrorefining, carrying out circulation dipping of between the containers and cells which were filled up with activated carbon, the stress reducer and the pit prevention agent were added and the electrolytic bath was adjusted. The electrocrystallization object with a thickness of about 60 micrometers which distributed the boron nitride particle was formed by making the basket made from titanium into which cathode and a nickel

pellet were put for the cylindrical matrix made from the rotating stainless steel into an anode plate, having added the proper brightener to these electrolytic baths, having maintained bath temperature and a pH value at the predetermined value, and continuing stirring. The content of the boron nitride particle in the obtained lubricative exoergic layer 5 was 5.5 % of the weight.

[0127] The lubricative exoergic layer 5 of the above configuration raises the lubricity of fixing film 10 inner skin, and bears the role which reduces the sliding friction of the fixing film 10, and the right heat-conduction member 40 and film supporter material 16. Therefore, the driving torque of an anchorage device 100 can be reduced.

[0128] b. The elastic layer 2 elastic layers 2 are silicone rubber, a fluororubber, fluoro silicone rubber, etc., and the quality of the material with sufficient thermal resistance and sufficient thermal conductivity is used.

[0129] The thickness of the elastic layer 2 has desirable 10-500 micrometers. This elastic layer 2 is thickness required in order to guarantee fixing image quality.

[0130] When printing a color picture, in a photograph, a solid image is formed over an especially big area on a recorded material P. In this case, if a heating surface (mold release layer 1) cannot be followed at the irregularity of a recorded material P, or the irregularity of the toner layer t, heating nonuniformity will occur and gloss nonuniformity will occur in an image in a part with many amounts of heat transfer, and few parts. The part with many amounts of heat transfer has high glossiness, and its glossiness is low in a part with few amounts of heat transfer. As thickness of the elastic layer 2, in 10 micrometers or less, the irregularity of a recorded material or a toner layer will not be able to be followed, and image gloss nonuniformity will occur. Moreover, when the elastic layer 2 is 1000 micrometers or more, it becomes difficult for the thermal resistance of an elastic layer to become large and to realize the quick start. The thickness of the elastic layer 2 has more preferably good 50-500 micrometers.

[0131] If the elastic layer 2 has a too high degree of hardness, it will not be able to follow the irregularity of a recorded material P or the toner layer t, and image gloss nonuniformity will generate it. Then, as a degree of hardness of the elastic layer 2, 45 degrees or less are more preferably good below 60 degrees (JIS-A:JIS-K A mold testing machine). About the thermal conductivity lambda of the elastic layer 2, 6x10-4 to 2x10-3 [cal/cm-sec and deg] is good. Thermal conductivity lambda of thermal resistance is large when smaller than 6x10-4 [cal/cm-sec and deg], and the temperature rise in the surface (mold release layer 1) of the fixing film 10 becomes late. In being larger than 2x10-3 [cal/cm-sec and deg], a degree of hardness becomes [thermal conductivity lambda] high too much, or a compression set gets worse. Therefore, as for thermal conductivity lambda, 6x10-4 to 2x10-3 [cal/cm-sec and deg] is good. 8x10-4 to 1.5x10-3 [cal/cm-sec and deg] is more preferably good.

[0132] c. The mold release layer 1 mold-release layer 1 can choose the good ingredient of mold-releases characteristic, such as a fluororesin, silicone resin, fluoro silicone rubber, a fluororubber, silicone rubber, and PFA, PTFE, FEP, and thermal resistance.

[0133] The thickness of the mold release layer 1 has desirable 1-100 micrometers. The problem that the bad part of a mold-release characteristic will be made in the ** nonuniformity of a paint film if the thickness of the mold release layer 1 is smaller than 1 micrometer, or endurance runs short occurs. Moreover, if a mold release layer exceeds 100 micrometers, the problem that heat conduction gets worse will occur, especially when it is the mold release layer of a resin system, a degree of hardness will become high too much, and the effectiveness of the elastic layer 2 will be lost.

[0134] C) Effect The configuration of the fixing film 10 of ********** consists of 60 micrometers of composite coatings which distributed the boron nitride particle with a mean particle diameter of about 1 micrometer 5.5% of the weight in nickel as silicone rubber 300micrometer and a lubricative exoergic layer 5 as PFA30micrometer and an elastic layer 2 as a mold release layer 1.

[0135] The boron nitride of the particle which the lubricative exoergic layer 5 was made to distribute by this example has the hexagonal crystal structure, and shows the outstanding lubricity to which even an ambient atmosphere 1000 degrees C or more maintains about 0.2 coefficient of friction with a boron nitride simple substance.

[0136] The configuration of the fixing film 10 used as an example of a comparison is the thing of the lamination of drawing 12 of the conventional example mentioned above. That is, the mold release layer which 1 becomes from PFA, the elastic layer which 2 becomes from silicone rubber, and 3 are exoergic layers which consist of nickel. In the configuration of the fixing film 10 of the example of a comparison, a different point from the

fixing film 10 in this example is having formed not a lubricative exoergic layer 5 like this example but the exoergic layer 3 which consists of nickel which only carries out electromagnetic-induction generation of heat, and is the same about the other mold release layer 1 and the elastic layer 2. [of the quality of the material and thickness] The thickness of the exoergic layer 3 of the fixing film 10 of the example of a comparison was set as 60 micrometers so that it might become equivalent to the thickness (60 micrometers) of the lubricative exoergic layer 5 of the fixing film 10 of this example. Thereby, the thickness of class 1-2-3 is equivalent at the example of a comparison, and this example, and becomes equivalent [the thickness of the fixing film 10 whole].
[0137] The effectiveness of this example was checked by evaluating the driving torque and the jam incidence rate of an anchorage device 100.
[0138] First, each anchorage device 100 equipped with the fixing film 10 of this example and the example of a comparison was built into full color image formation equipment, and **** durability was performed.
[0139] With the fixing film 10 of the example of a comparison, when it remained as it is, the sliding friction was high, and since stable paper conveyance was unrealizable, about 1g of high temperature greases was applied to the film guide contact surface side as lubricant. a **** rate -- for 1 minute -- A4 size paper -- a 16-sheet copy -- the speed by which paper is carried out -- it is -- a connoisseur -- Kaminaka's temperature control was set as 190 degrees C which is the temperature which can be established.
[0140] and A4 size paper -- a 100,000-sheet copy -- the driving torque of the anchorage device 100 before and after carrying out paper, and change of a slip incidence rate were investigated.
[0141] About driving torque, on the pressurization roller 30 whose fixing film 10 is a drive means of communication, since it was the configuration which carries out follower rotation, driving torque measured the output torque of the pressurization roller 30. the evaluation approach -- a fixing temperature control condition -- the output torque at the time of empty rotation -- a 100,000-sheet copy -- we decided to measure and compare in front of paper and in the back.
[0142] About the slip, the incidence rate of the slip generated between a recorded material P and the pressurization roller 30 was investigated. A recorded material P can detect whether paper was delivered from the anchorage device 100 in predetermined time, and, as for the delivery sensor (non-** Fig.) by which generating of this slip was prepared in the anchorage device 100, can know the count of generating of a slip by acting as the monitor of that detection signal. the evaluation approach -- 100,000 -- it set on sheet copy paper, and the slip incidence rate for 95000-100000 pages was investigated and compared in the end for initial 0-5000 pages.
[0143] These results are shown in the part of the example 1 of Table 1, and the example of a comparison.
[0144] As shown in Table 1, with the fixing film 10 of the example of a comparison, driving torque carried out the increment in 2.3 kgf-cm before and behind the **** durability of 100,000 sheets. This is because degradation of the grease by the oil component of grease having volatilized and the nickel layer generated by sliding could be deleted and the lubricity of grease was lost with powder.
[0145] Moreover, although a slip was not generated the early stages of durability, the slip incidence rate increased by the increment in driving torque in the end of durability.
[0146] On the other hand, in this example, driving torque almost equivalent to the example of a comparison is realizable without spreading of lubricant in the early stages of durability.
[0147] furthermore, a 100,000-sheet copy -- it turns out that driving torque is suppressed after paper by the increment in +0.3 kgf-cm, and the driving torque in early stages of **** is maintained mostly. A slip was not generated in the early stages of durability, and the final stage, either.
[0148] Thus, conveyance of the recorded material stabilized from beginning to end is realizable with the fixing film 10 of this example.
[0149]
[Table 1]

表 1

	実施例1	実施例2	比較例
定着フィルム内周面	BN粒子＋ニッケル	PTFE粒子＋ニッケル	ニッケル（＋グリース）
駆動トルク (kgf・cm)			
耐久前	3.0	2.8	2.6
耐久後	3.3 <+0.3>	3.0 <+0.2>	4.9 <+2.3>
スリップ発生率			
耐久初期	0	0	0
耐久終盤	0	0	131/5000

BN:窒化ホウ素　　< >内は、耐久後－耐久前の軸トルクの差を表す

[Translation done.]

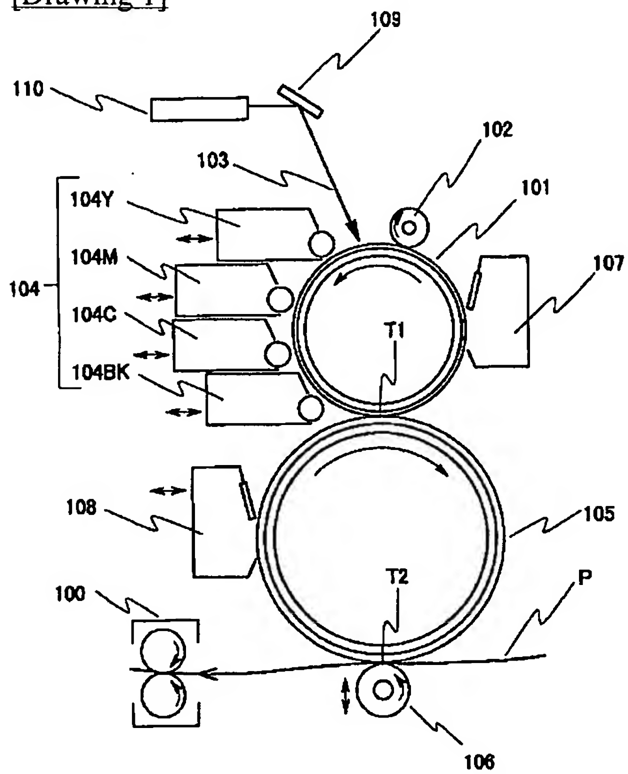
DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] The outline configuration model Fig. of the image formation equipment in the 1st example
[Drawing 2] The crossing side-face model Fig. of the important section of an anchorage device
[Drawing 3] Similarly it is the transverse-plane model Fig. of an important section.
[Drawing 4] Similarly it is the vertical section model Fig. of an important section.
[Drawing 5] The strabism model Fig. of the film guide member of the right-hand side which made the interior carry out arrangement support of an exiting coil and the magnetic core
[Drawing 6] Drawing having shown the relation between a magnetic field generating means and calorific value
[Drawing 7] Insurance circuit diagram
[Drawing 8] The lamination model Fig. of the electromagnetic-induction febrility fixing film as a heating component
[Drawing 9] The graph which showed the relation between the exoergic layer depth and electromagnetic wave reinforcement
[Drawing 10] The lamination model Fig. of the electromagnetic-induction febrility fixing film as a heating component in the 3rd example
[Drawing 11] The outline configuration model Fig. of an example of the heating apparatus (image heating anchorage device) of an electromagnetic-induction exoergic method
[Drawing 12] The lamination model Fig. of the electromagnetic-induction febrility fixing film as a heating component
[Description of Notations]
1 [-- A lubricating layer, 5 / -- Lubricative exoergic layer,] -- A mold release layer, 2 -- An elastic layer, 3 -- An exoergic layer, 4 10 [-- Exiting coil,] -- A fixing film, 16 -- Film supporter material, 17 -- An excitation core, 18 22 [-- Temperature sensor,] -- The rigid stay for pressurization, 23 -- Flange material, 25 -- A pressurization spring, 26 27 [-- Thermo switch,] -- An excitation circuit, 30 -- A pressurization roller, 40 -- A good heat-conduction member, 50 51 [-- Electrification equipment,] -- A relay switch, 100 -- An anchorage device, 101 -- A photoconductor drum, 102 103 [-- An imprint roller, 107 / -- A cleaner, C / -- Alternate magnetic flux, H / -- An exoergic location, M / -- A driving means, N / -- The fixing nip section, P / -- A recorded material, t / -- A toner, T1 / -- The primary imprint section, T2 / -- Secondary imprint section] -- Laser light, 104 -- A development counter, 105 -- A middle imprint drum, 106

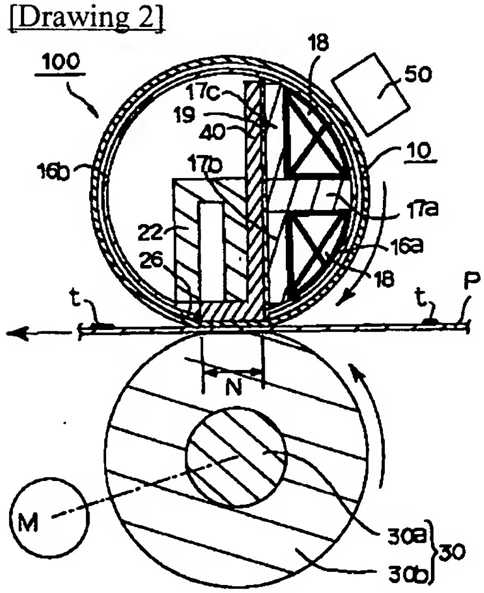
[Translation done.]

DRAWINGS

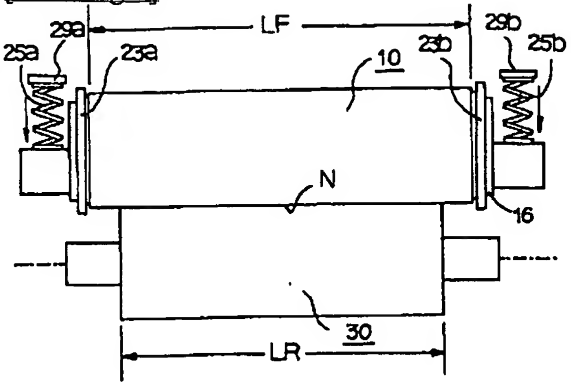
[Drawing 1]



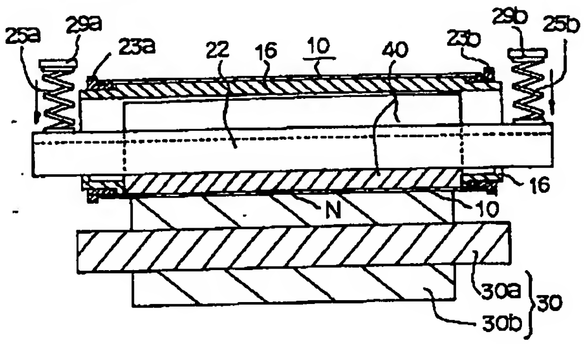
[Drawing 2]



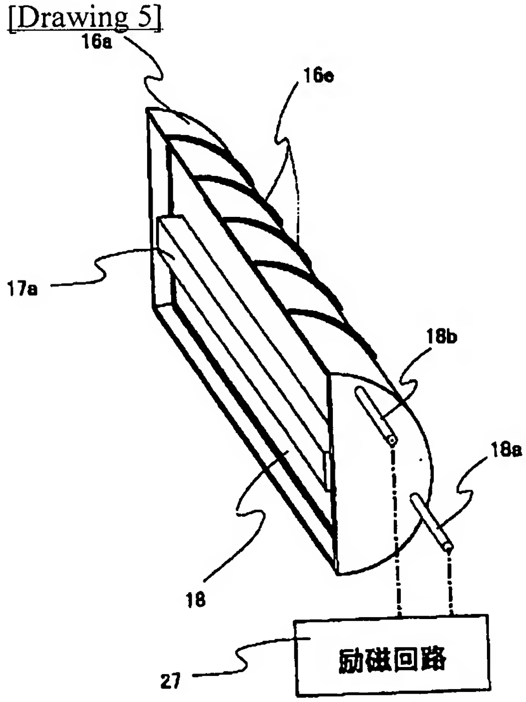
[Drawing 3]



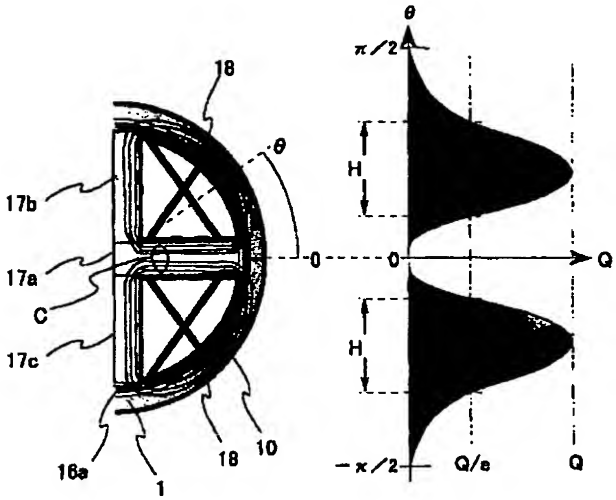
[Drawing 4]



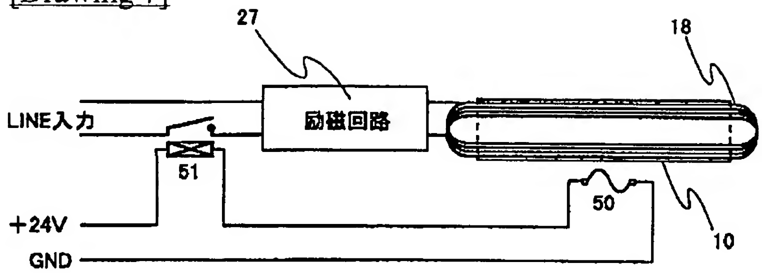
[Drawing 5]



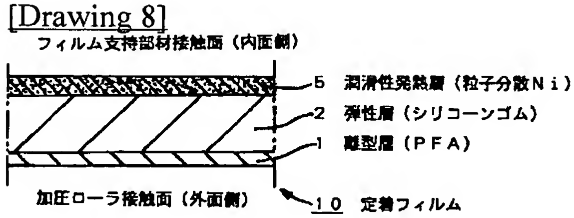
[Drawing 6]



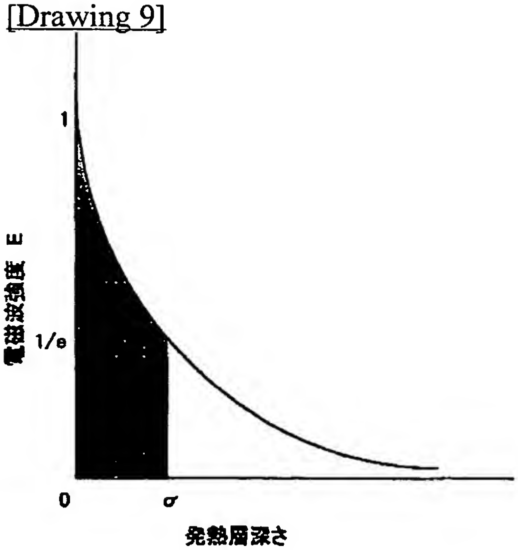
[Drawing 7]



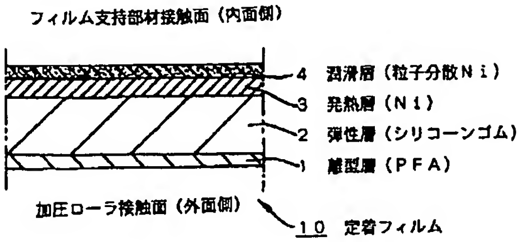
[Drawing 8]



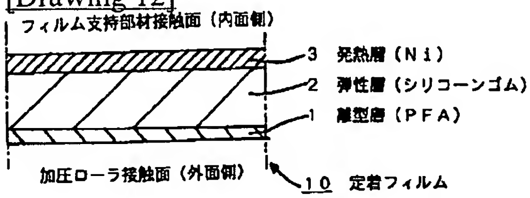
[Drawing 9]



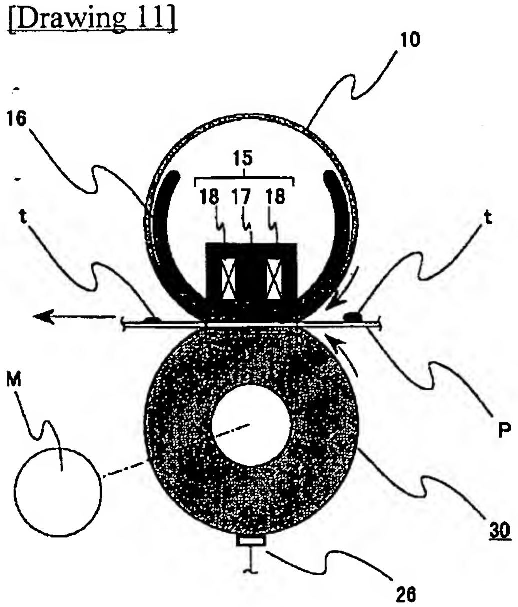
[Drawing 10]



[Drawing 12]



[Drawing 11]



[Translation done.]